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NATIONAL CONFERENCE ON INNOVATIONS & CHALLENGES IN GEOTECHNICAL ENGINEERING, COMPUTER SCIENCE AND VLSI

(NCGCE - 21)

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General Secretary Message

Mr. Mohamed Rafeek
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I am extremely glad and enlightened to host National Conference on Innovations & Challenges in Geotechnical Engineering, Computer Science and VLSI at IES College of Engineering. NCGCE- 2020 has provided an excellent international forum for sharing knowledge and results in Recent Challenges in Engineering Technology. The aim of the Conference was to provide a platform to the researchers and practitioners from both academia as well as industry to meet and share cutting-edge development in the field. I would like to extend my happiness for the conference proceeding journal which is being published in association with the conference.

Organizer Message

Dr.S.Kamalakannan
Head of Department,
Department of Civil Engineering,
IES College of Engineering

It gives me a great pleasure to welcome you to the National Conference on Innovations and challenges in Geotechnical Engineering, Computer Science and VLSI (NCGCE-21). The purpose of this conference is to provide ample opportunities to students and researchers to network and share ideas and information. The conference will serve to be the right platform for the budding engineers to share their views on sustainability. I hope this conference will be enjoyable, memorable and productive for participants and looking forward to the technological innovations that result from your networking and discussions.

Principal Message

Dr.S.Brilly Sangeetha
Principal
IES College of Engineering, Thrissur

Now-a-days researchers are not only pondering but also experiencing the overwhelming outcomes of interdisciplinary researches. Moreover, it has been ubiquitously encouraged by the governments, research agencies and by the academic institutions. The intent behind the multidisciplinary conference is to provide a common platform, delegates from industry and nominees from various Government and Private Universities and Institutions can sit together, and cherish about achievements so far, as well as deliberate upon futuristic approaches along with major bottlenecks. The deliberations will not only encompass all avenues of electrical, electronics, Civil, computer Science ,Mechanical and information technology but also through spotlight on positive and inadvertent impact of modern technologies on society. I would like to express my appreciation to the team for making this extraordinary conference a possibility & wish all the very best for the conference proceedings which is being published.

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The Performance of Prestressed Geosynthetic Reinforcement on Footings: A Review Paper

Hasnath Sharraj[1], Ranjima K .S[2], Athulya Varghese[3]
[1,2,3] PG student, Department of Civil Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala,, India

Abstract – The sudden increase in population has increased construction activities. And in the present scenario, the construction activities take place in those lands which are of low quality. There are many methods are practiced to increase the performance of soil. Here one of the techniques that are used to improve the performance of low-quality soilis discussed.Geosynthetic Reinforcement is one such technique that helps in increasing the soil bearing capacity and helps in the reduction of settlement that is caused byvarious reasons. Prestressed Geosynthetic Reinforcement is one such technique that helps in increasing the soil bearing capacity and helps in the reduction of settlement that is caused by various reasons. The application of Prestressed Geosynthetic reinforcement results in an improvement in the performance of footing such as circular footing, square footing on various soil such as sandy soil, expansive soil.

Key words - Prestressed Geosynthetic Reinforcement, Bearing capacity, Settlement

I. INTRODUCTION

The application of geosynthetic materials as a reinforcing material has resulted in the improvement of bearing capacity as well as help in the reduction of the settlement. It has turned out to be a better ground improvement method. As a part of emerging techniques in construction application of prestressed geosynthetic reinforcement helps in solving the problems related to soil bearing capacity and settlement. Various experimental investigations are been carried out to study the performance of prestressed geosynthetic reinforcement.And from all the investigation reports it is observed that addition of prestressed geosynthetic material has increased the bearing capacity, improved the settlement rates, and also other parameters like magnitude, soil density. This review paper points out the performance of prestressed geosynthetic reinforcement on footings for various soils.

II. SUMMARY OF LITERATURE REVIEW

(G Madhavi Latha et.al. 2009) experimented to study the Bearing capacity of square footings on geosynthetic reinforced sand. The Bearing capacity of footings placed on geosynthetic reinforced sand was determined.The effects of various reinforcement parameters like the type, the amount of reinforcement, the tensile strength of geosynthetic materials, the configuration of geosynthetic layers under the footing, and the improvement in the bearing capacity of the footings is studied through the systematic model studies. A steel tank of dimension 900 x 900 x 600 mm was used for conducting the test. Four types of grids, like strong biaxial geogrid, uniaxial geogrid, weak biaxial geogrid, and a geonet each having different tensile strengths were used in the tests. The Geosynthetic reinforcement was provided in planar layers, with varying depths of the reinforced zone was provided below the footing. The influence of all the above parameters on improving the bearing capacity of square footing and the settlement was studied by comparing it with that of the test conducted on unreinforced sand. Results showed that the effective depth of reinforcement was twice the width of the footing and the optimum spacing of geosynthetic layers was half the width of the footing.And it was observed that the layout and the configuration of reinforcement play a vital role in improving the bearing capacity.

(Julie Lovisa et.al. 2010) conducted an experimental investigation on the Behaviour of prestressed geotextile

reinforced sand bed supporting a loaded circular footing. The experimental program involves the use of small-scale load tests. The sand used for the experiment was poorly graded sand. The loading tests were carried out on a circular rigid footing which was prepared from mild steel. The footing was 20 mm thick and 100 mm in diameter. The prestress applied was 2% of the allowable tensile strength of the geotextile and it was distributed. The test tank was of the following dimensions: 0.8x 0.8 m in plan and 0.6 m high. The steel circular footing was considered rigid because of the high strength and stiffness properties of steel. The footing was placed on the surface of the sand bed in the test tank. And a compressive load was applied. The readings were noted. The bearing capacity and settlement rates were determined. From the above investigation, it was concluded that prestressed geosynthetic reinforcement improved the settlement and the bearing capacity.

(J. Jayamohan et.al. 2012) studied the performance of Prestressed Reinforced Granular Beds Overlying Weak Soil. The experimental investigation consists of laboratory tests based on bearing capacity. The footing was placed over the prestressed reinforced granular bed overlying weak soil. The material which was used for the granular bed was sand. Locally available shedi soil was used as weak soil. The bearing capacity tests were carried out using a square rigid footing which was made of mild steel. The dimensions of the model footing were 100 x 100 x 20 mm thick. During all the tests the footing was kept on the surface of the soil. The test tank was made of ferrocement having internal dimensions of 0.75 x 0.75 m in plan and 0.75 m high. A single layer of reinforcement was used in the experiment. The prestress was applied which was equal to 1%, 2%and 3% of the tensile strength of the geonet and is distributed over three pulleys. Through numerical analysis, the Mohr-Coulomb model was used to study soil behaviour. Based on results obtained from the experiments and the numerical investigation, it was concluded that there is a significant improvement in the bearing capacity as well as the settlement. The improvement of bearing capacity was based on the thickness of the granular bed, the direction of prestressing, and the magnitude of prestress.

(Dhatrak A. I. 2014) made a study on the behaviour of square footing on prestressed geosynthetic reinforced sand. The experiment involved a series of laboratory bearing capacity tests which was conducted on a model footing that was placed over the reinforced sand bed. For the test, dry, clean, and cohesionless Kanan soil collected from Maharashtra was used. The model footing of three different sizes made up of cast iron material was used. The dimensions of the footings are 5 x 5 cm, 7.5x7.5 cm, and 10 x 10 cmand 1 cm thick. The Biaxial geogrids were used to reinforce the sand bed. These performance geogrids are made of high tenacity knitted polyester yarns with a proprietary coating and high molecular weight. Various laboratory tests such as sieve analysis, specific gravity, the density of sand, relative density, angle of internal friction of sand were determined. A laboratory plate load test was conducted to determine the bearing capacity and settlement. The test tank is having internal dimensions 600 x 600mm in plan and 450 mm high with a thickness of2mm. The bed was made by using geogrids and sand.The top surface was leveled and the load was applied and results were noted. And it was concluded that the size of the footing plays an important role in improving the load-bearing capacity. Hence the application of prestress to geosynthetic reinforcement helped in improving the settlement rates as well as improved the bearing capacity.

(Ramaiah Shivashankar et.al. 2014) studied the Effects of prestressing the reinforcement on the behaviour of reinforced granular beds overlying weak soil.The dimensions of the tank were 750 x 750 x 750 mm. The model footing was a rigid mild steel plate of 100x 100 mm size and 20 mm thickness. The footing was loaded with a hand operated Jack of 10 kN. The impact of prestressing the reinforcement on the strength improvement and in settlement reduction of a reinforced granular bed overlying the weak soil was investigated through laboratory-scale bearing capacity tests.The effects of parameters like the strength of underlying weak soil, the magnitude of prestressing force, direction of prestressing forces, and thickness of granular bed were examined. Finite element analyses were carried out to study the effect of prestressing the reinforcement. Results thus obtained was that prestressing the geosynthetic reinforcement resulted in improvement of the load-bearing capacity of soil without large

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settlements when compared to geosynthetics without any prestress.

(Shailendra Kumar et.al. 2015) carried out a test to study the behaviour of prestressed geotextile-reinforced fine sand bed supporting an embedded square footing. A series of laboratory model tests were carried out on embedded square footing supported by a geotextile reinforced sand bed. The effects of reinforcement using geotextile were studied with the help of laboratory model tests with different depths of placement below the footing and the size of the geotextile. The impacts of prestressing the geotextile on the strength increment and the settlement reduction of a reinforced sand bed were investigated. The model steel tank was of the size 120 cm x 50 x 50 cm and a square footing of 10 cm are used. The study shows the effect of the size of geotextile and the placement of geotextile below the footing on load-settlement characteristics.From the experiment, it was concluded that the effect of reinforcement used was signed up to a depth of 2B below the footing.

(Azzam et.al. 2015) carried out tests to determine the bearing capacity of shell strip footing on reinforced sand.The ultimate load capacities of shell foundations on reinforced and unreinforced sand by laboratory model tests were found out.The test box was having inside dimensions of 90 x 30 cm in plane and 120 cm in depth, the wall thickness of the tank was 6 mm.The sand used was medium to coarse silica sand anda homogenous bed of dry silica sand was formed. A series of loading tests were conducted on model shell footing without and with a single layer of reinforcement. The tests were conducted for shell foundation at different subgrade densities and shell embedment depth. The experimental studies showed that the ultimate load capacity of shell footing on the reinforced subgrade is more when compared to those on unreinforced cases. And it was concluded that the shell foundation over reinforced subgrade can be considered as a good method to improve the effective depth of the foundation and to decrease the resulting settlement.

(Harikumar et al.2016) performed Laboratory plate load tests on a model footing placed on a sand bed which was reinforced with plastic multi-directional reinforcements. The settlement and the bearing capacity were calculated and the spacing between reinforcements in a layer, the effect of depth to the first layer number of layers, and spacing between layers was determined. An appreciable increase in the bearing capacity was observed when the depth to the first layer of reinforcement was increased beyond 0.1B. While placing the reinforcements beyond a depth of 0.5B in a single layer has resulted in a reduction in the increment of bearing capacity. And it was concluded that the bearing capacity was increased by 1.3 times and the settlements was reduced 72%.

(Shravan D. Konnur et.al.2017) experimented on the Impact of Prestressed Geosynthetic Reinforced Sand Bed on the Performance of Square Footing. In this experiment a test tank made of wood of size 0.86 m x 0.86 m x 0.46 m having 25 mm thickness was used. 1 mm steel plate was fixed on the sides, inside the box to prevent the bulging effect. A model square footing having a size of 0.12 m x 0.12 m with a thickness of 0.02 m was used. Uniaxial Geogrid and Woven Geotextile were used as the reinforcing material. The sand bed was laid and the model footing, as well as the geosynthetic reinforcement, was placed and the load was applied. The following results were obtained. The application of prestress to the Geogrid and Geotextile reinforcement resulted in a decrement of settlement of footing and enhanced the bearing capacity. U/B ratio of 0.25 was proved to be the optimum depth for placement of the geosynthetic materials.

(Ravindra Budania et.al. 2017) carried out an experimental study of rectangular footing resting over geogrid reinforced sand. The impact of the geo-grid reinforcement on the bearing capacity of sand was studied. The model tests were conducted using rectangular footing at U/B equal to 0.25 & 0.55. The sand was reinforced by multiple layersof geo-grid. The ultimate bearing capacity of sand with rectangular footing was calculated through load settlement curves. Through these load-settlement curves, there was an appreciable increase in the bearing capacity of sand was observed when the depth to the first layer of reinforcement was increased. The optimum depth of placement of the first layer was kept as 0.5B and it was concluded that the bearing capacity of sand for rectangular footings was increased by 1.5 times the bearing capacity of unreinforced sand.

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III. DISCUSSION

It was concluded that the past studies were conducted to know the change in engineering properties by using prestressed geosynthetic reinforcements. Different laboratory tests and numerical analyses were conducted on these prestressed geosynthetic reinforcements. Soil properties such as load-bearing capacity and the settlements were greatly influenced by using prestressed geosynthetic reinforcements.Moreover, the application of these helps in the easier construction of buildings in low-quality soils. It was proven that researchers like G Madhavi Latha et.al (2009), Julie Lovisa et.al (2010), J. Jayamohan et.al (2012), Dhatrak A.I (2014), Ramaiah Shivashankar et.al (2014), Shailendra Kumar et.al (2015), Azzam et.al (2015), Harikumar et al. (2016), Shravan D. Konnur et.al. (2017), Ravindra Budania et.al (2017) explained the details regarding the use of prestressed geosynthetic reinforcement for footing. And various parameters were determined.

IV. CONCLUSION

Various methods are being practiced to improve the performance of different types of footing on different soils. The low bearing capacity and increase in settlement rates have reduced the construction activities in poorly graded soil.In such cases, the application of prestressed geosynthetic reinforcement has turned out to be very effective. The results from various experimental investiagtion show that the usage of prestressed geosynthetic reinforcement has increased the bearing capacity and it has reduced the settlement.And today application of prestressed geosynthetic reinforcement has become one of the best ground improvement techniques. Thus making construction work easier.

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Small and Cost Effective Solar Efficiency Tracker

Jasna K[1], Mebin George Mathew[2]
[1] Assistant Professor 1 Electronics and Communication Engineering, College of Engineering,Perumon,Kollam
[2] Research Assistant 2 Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum

Abstract – The sun produces unlimited amounts of light energy and will perhaps do so forever. Solar panels were invented to take advantage of the sun's almost limitless amount of energy. Although the sun creates a lot of light energy, people cannot use it directly to power their homes and buildings. Instead, they need solar panels to catch the radiation, use it to create electrical energy, and then convert it into a form of electricity that can be stored and used to run various appliances, lights, and other devices. Solar panel users should check their solar panels regularly, not just to ensure that they are getting the most out of their investment, but to ensure that they are functioning properly and have sustained no damage. For the most part, good quality solar panels will last for years without needing to be replaced. However, there are a few factors that can affect solar panels and cause them to have a lower output even when the hardware is 100 percent functional. These factors include sky condition, positioning, temperature, and shade. The Solar EfficiencyTracker is a device which is small and is of low cost that helps to monitor the efficiency of solar panels. It allows homeowners, small building owners, installers and manufacturers to easily develop estimates of performanceof potential PV installations.

INTRODUCTION

Photovoltaic or pv for short, is a method that is unique and distinctive in harnessing the sun's energy. One of the results that should be taken into account in the use of solar panels is the efficiency of the solar panel itself, because efficiency refers to the amount of light of the whole module that turns it into electricity. Nowadays there is no device available formeasuring the solar panel efficiency in real time. The proposed device is capable of calculating the solar panel efficiency by means of multiple sensor data acquisition. The different sensors used here are lm35 for temperature sensing, LDR for light intensity measurement, acs712 for current sensing, a simple voltage divider network for the measurement of voltage and dht11 for humidity measurement. The data obtained from the sensor modules are given to the microcontroller atmega2560. The microcontroller calculates the efficiency by using the predetermined algorithm. The efficiency of solar cells influences the output value of the solar panel, where it is proportional to the amount of solar radiation that is produced [1]. The solar panel should be monitored in real time in order to maintain the output value and the consistency of the value. By using this device, we will be able to monitor the efficiency in real time from the existing panel structures and this may lead to drastic development in the field of solar energy generation sector. Solar energy is one of the sources of renewable energy that is used to generate electricity. It uses photovoltaic cells, or also known as solar cells, solar energy can be converted into electricity. Solar cells produce direct current electricity (DC) and can be converted to electrical alternate current (AC) through inversion techniques [2]. Solar energy has been widely used today as a green technology that has been implemented by the government. With increasing energy supply, renewable energy generation technology has attracted the world's attention. Where solar is one of the renewable energy and environment friendly. Therefore, this solar project has developed rapidly under government incentives to develop green technologies. With the solar monitoring system is an application of solar energy technology that can effectively solve the problem of environmental monitoring. The advantages of using solar panels are environmental friendly and renewable energy, easy installation and maintenance, and long shelf life and it is ideal for users who are using a large scale of solar panel. Solar power generation has several advantages over other forms of electricity generation. A small development in this sector can

lead to overall development of the nation. This device may help to calculate the efficiency of solar panels during power generation. This may lead to great improvement in the field of solar panel production sector and also helps in the calibration process [3].

ESTIMATION OF SOLAR RADIATION

The output of a PV system depends mainly on the amount of solar irradiation. The solar radiation reaching the earth's surface can be classified into three. Direct radiation, diffuse radiation, and reflected radiation. The radiation which can be captured directly from the sun are known as direct radiation. Diffused radiation is the one which is scattered by the effect of atmospheric particles, clouds etc. And finally the reflected radiation is the one that gets reflected back by the earth surface [6]. To find out the solar potential of the Trivandrum it's necessary to analyze the solar radiations measured during different months. The required data is collected from the MNRE (Ministry of New and Renewable energy) website. For the ease of analysis data for the three consecutive days of every month is taken into account.

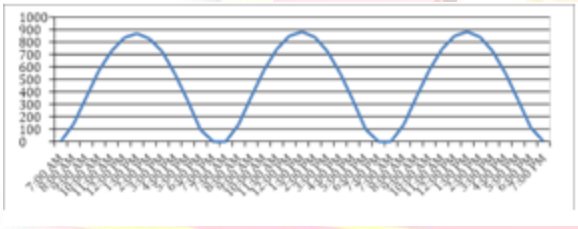

Fig.1 Amount of solar radiation measured during the month January

TABLE I

Amount of solar radiation measured during the monthJanuary

DATE	TIME	AMOUNT OF RADIATION RECEIVED W/M²
1/1/2018	7:00 AM	0
1/1/2018	8:00 AM	138
1/1/2018	9:00 AM	353
1/1/2018	10:00 AM	569
1/1/2018	11:00 AM	727
1/1/2018	12:00 PM	834
1/1/2018	1:00 PM	869
1/1/2018	2:00 PM	825
1/1/2018	3:00 PM	721
1/1/2018	4:00 PM	541
1/1/2018	5:00 PM	327
1/1/2018	6:00 PM	94
1/1/2018	7:00 PM	0
2/1/2018	7:00 AM	0
2/1/2018	8:00 AM	137
2/1/2018	9:00 AM	361
2/1/2018	5:00 PM	331
2/1/2018	6:00 PM	97
2/1/2018	7:00 PM	0
3/1/2018	7:00 AM	0
3/1/2018	8:00 AM	136
3/1/2018	9:00 AM	360
3/1/2018	10:00 AM	572
3/1/2018	11:00 AM	742
3/1/2018	12:00 PM	849
3/1/2018	1:00 PM	883
3/1/2018	2:00 PM	840
3/1/2018	3:00 PM	725
3/1/2018	4:00 PM	549
3/1/2018	5:00 PM	333
3/1/2018	6:00 PM	111
3/1/2018	7:00 PM	0
Total		18179
Average		466.12820 51
Maximum		883
Minimum		0

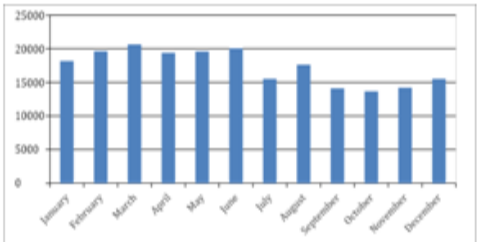

Fig.2 Amount of solar radiation measured during eachmonth

TABLE II

Total and Average radiation measured in each month

MONTH	TOTAL SOLAR RADIATION IN W/M²	AVERAGE SOLAR RADIATION RECEIVED W/M²
January	18179	466.12
February	19644	503.69
March	20645	529.35
April	19386	497.07
May	19627	503.25
June	20079	529.35
July	15536	398.35
August	17640	452.3
September	14126	362.2
October	13664	350.35
November	14224	364.71
December	15539	398.43

It has been observed that the maximum total solar output is obtained during the month of March and the minimum total solar output is during the month of October.

BLOCK DIAGRAM

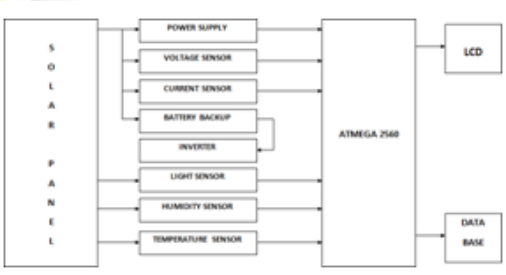

Fig 3. Block diagram

BLOCK DIAGRAM DESCRIPTION

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TEMPERATURE SENSOR :LM35 is the temperaturesensor used in SOLAR EFFICIENCY TRACKER. The

LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. It has a linear scale factor of 10.0 mV/ degree Celsius. The LM35 thus has an advantage over linear temperature sensors calibrated in degree Kelvin, as the user is not required to subtract a largeconstant voltage from its output to obtain convenient Centigrade scaling. The LM35 is rated to operate over a 55 degree to a150 degree Celsius temperature range, It is suitable for remote applications.

LIGHT SENSOR

Light Dependent Resistor is used to indicate light intensity. A light dependent resistor is a resistor whose resistance decreases with increasing incident light intensity. It can also be referenced as a photoconductor. It is made of a high resistance semiconductor. If light falling on the device is of high enough frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band. The resulting free electron (and its hole partner) conduct electricity, thereby lowering resistance.

HUMIDITY SENSOR:

The DHT11 is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and spits out a digital signal on the data pin (no analog input pins needed). It's fairly simple to use, but requires careful timing to grab data. This DHT11 Temperature and Humidity Sensor features a calibrated digital signal output with the temperature and humidity sensor capability. It is integrated with a high-performance 8-bit microcontroller. Its technology ensures high reliability and excellent long-term stability. This sensor includes a resistive element and a sensor for wet NTC temperature measuring devices. It has excellent quality, fast response, anti-interference ability andhigh performance.

CURRENT SENSOR:

ACS712 provides economical and precise solutions for AC or DC current sensing in industrial, commercial, and communications systems. The device package allows for easy implementation by the customer. Typical applications include motor control, load detection and management, switched-mode power supplies, and over current fault protection. The device consists of a precise, low-offset, linear Hall sensor circuit with a copper conduction path located near the surface of the die. Applied current flowing through this copper conduction path generates a magnetic field which is sensed by the integrated Hall IC and converted into a proportional voltage. Device accuracy is optimized through the close proximity of the magnetic signal to the Hall transducer.

VOLTAGE SENSOR:

A voltage divider is a simple circuit which turns a large voltage into a smaller one. Using just two series resistors and an input voltage, we can create an output voltage that is a fraction of the input. Voltage dividers are one of the most fundamental circuits in electronics.

POWER SUPPLY:

The power source consists of a 12volt 1ah lithium ion battery. These 78xx series regulators give a maximum output current of about 1.5 amps at fixed stabilized voltages of 5, 6, 8, 9V respectively according to the power requirements of the multiple sensors and microcontroller.

LCD DISPLAY:

LCD (liquid crystal display) is the technology used for displays in notebooks and other smaller computers. Like light-emitting diode (LED) and gas-plasma technologies, LCDs allow displays to be much thinner than cathode ray tube (CRT) technology. LCDs consume much less power than LED and gas-display displays because they work on the principle of blocking light rather than emitting it.

DATABASE:

A database is an organized collection of data. A relational database, more restrictively, is a collection of schemas, tables, queries, reports, views, and other elements.

ATMEGA 2560:

The Arduino Mega 2560 is a microcontroller board based on the ATmega2560. It has 54 digital input/output pins (of which 15 can be used as PWM outputs), 16 analog inputs, 4 UARTs (hardware serial ports), a 16 MHz crystal oscillator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. The Mega

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2560 board is compatible with most shields designed for the Uno and the former boards Duemilanove or Diecimila.

CIRCUIT DIAGRAM

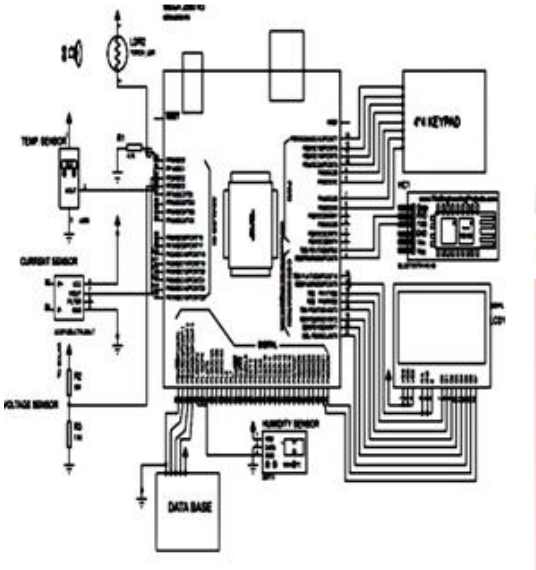

Fig 4, Circuit diagram

The hardware design is able to monitor the efficiency of the solar panel. The hardware contains different types of sensor modules such as light sensor, humidity sensor, temperature sensor, current sensor, voltage sensor, an LCD display, Arduino mega 2560 and a database. The signal received by the sensors will be processed by the Arduino Mega and the efficiency of the panel is displayed in real time over the LCD with the help of the algorithm provided in the microcontroller and by using the data of the solar panel which is available over the data base .No such devices are now available in the market for the real time estimation of efficiency. The light sensor here we have used is the Light Dependent Resistor (LDR). It has been calibrated initially with the help of the illuminance meter and later by the irradiance meter which is available in the market. Now the device is able to monitor the solar irradiance in real time. Because efficiency depends on the input and output parameters. The input of the solar panel being the solar irradiance. There are many adverse factors which may cause lowering the efficiency of the solar panels. So in order to calculate the efficiency of the panels we could also measure those factors such as temperature, humidity..etc. The temperature may be adversely affected when it increases above a particular limit. The output of PV systems depends strongly on the average daily solar radiation incident upon the array, which in turn depends on its orientation and tilt [4]. However, values of solarradiation are most often reported for horizontal surfaces, therefore converting monthly average horizontal radiation values to their plane-of-array equivalent is the first task faced by the program .Besides, the output of the solar array also depends on temperature and operating point of the system. The solar radiation is normally integrated over a time frame of one day to estimate the energy output. The solar array is rated at the radiation level of 1000 W/m and the cell temperature of 25ºC, the peak sun hours (PSHS) is often used to express solar irradiation so that the daily output of the solar array is easily calculated by simply using the peak watt (Wp) of the solar array times the PSHs, where the PSHs is the length of time in hours at an radiation level of 1000 W/m needed to produce energy equivalent to the total energy in one day Once the maximum power has been obtained, it is divided by the area of the solar cell to get the maximum power per area[5]. Then this number is divided by the power per area of the incident light and multipliedby 100% to give the % efficiency.

% Efficiency = (Max Power/Area) (generated Solar Cell) / (Power/area) (incident light)

Another Quantity that is often quoted is the fill factor. The fill factor is defined as: Max Power per Area (from solar cell) / Ideal Max Power per Area. There are a few factors that can affect solar panels and cause them to have a lower output even when the hardware is 100 percent functional. These factors include sky condition, positioning, temperature, and shade. The Solar Efficiency Tracker is a device which is small and is of low cost that helps to monitor the efficiency of solar panels. It allows homeowners, small building owners, installers and manufacturers to easily develop estimates of performance of potential PV installations.

CONCLUSIONS

Solar energy is the one of the energy that can be renewed. Renewable energy generation technology has attracted the world's attention. This energy can be converted in to a useful electrical form by the use of solar panel. The conversion rate of the solar panel depends on the efficiency of the solar panel. Solar cell efficiency refers to the portion of energy in the form of sunlight that can be converted electricity. So here we are

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introducing a device to calculate the efficiency of the solar panel. Efficiency depends on the input and output parameters. The input of the solar panel being the solar irradiance. There are many adverse factors which may cause lowering the efficiency of the solar panels. So in order to calculate the efficiency of the panels we could also measure those factors such as temperature, humidity..etc. The temperature may be adversely affected when it increases above a particular limit. The output of PV systems depends strongly on the average daily solar radiation incident upon the array, which in turn depends on its orientation and tilt. However, values of solar radiation are most often reported for horizontal surfaces, therefore converting monthly average horizontal radiation values to their plane-of-array equivalent is the first task faced by the program .Besides, the output of solar arrays also dependson temperature and operating point of the system. The solarradiation is normally integrated over a time frame of one day to estimate the energy output. The solar panel should be monitored in real time in order to maintain the output valueand the consistency of the value. By using this device, we will be able to monitor the efficiency in real time from the existing panel structures and this may lead to drastic development in the field of solar energy generation sector.

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Soil Piping Mechanism in Flow Slide Prone Areas

ANJU R NAIR[1], ANINA P JOSE[2], ANJU E M[3], JERIN K LAZAR[4]

[1,2,4] PG Student, Department of Civil Engineering, IES College of Engineering, Chittilappilliy, Thrissur, Kerala, India

[3]Assistant Professor, Department of Civil Engineering, IES College of Engineering, Chittilappilliy, Thrissur, Kerala, India

Abstract – Soil piping is not only a geomorphologic, but also a land degradation process that may cause environmental damage affecting people's lives. Objective of this research program is to develop an understanding of the piping mechanisms for various soils and also conducted a field study in kuthiran, Thrissur, kerala. A constant head hole erosion test is performed on various soil. Upon the completion of the test significantly measurable enlargement of performed hole is performed. By implementing synthetic abatement (modified polysaccharides) and bio- abatement (Vesicular Arbiscular Mycorrhize), we can reduce soil piping in plain terrain as well as hilly areas.

Keywords: modified polysaccharides, Versicular Arbiscular Mycorrhize

INTRODUCTION

The "Soil piping", (fig.1) also known as tunnel erosion is the subsurface erosion of soil by percolating waters to produce pipe-like conduits below ground especially in non-lithified earth materials. Soil piping or "tunnel erosion" is the formation of subsurface tunnels due to subsurface soil erosion. Piping is an insidious and enigmatic process involving the hydraulic removal of subsurface soil causing the formation of an underground passage.

Fig.1 Soil Piping

During rain percolating waters carries finer silt and clay particles and forms passage ways. The resulting "pipes" are commonly a few millimeters to a few centimeters in size, but can grow to a meter or more in diameter. They may lie very close to the ground surface or extend several meters below ground. Once initiated they become cumulative with time, the conduits expand due to subsurface erosion leading to roof collapse and subsidence features on surface. Since it happens in the underground, in many cases the phenomenon goes unnoticed. The cavities or pipes developed below the ground grow with respect to time and affect large extents of land in the form of subsidence thereby making it not suitable for cultivation. Occasionally the subsurface flow of water can result in conduits (pipes) through relatively insoluble classic deposits. The piping results in caving and collapse of surficial conduits. This is an important process in the head ward extension of gullies, especially in arid semi-arid regions. The materials most subject to piping include fine- grained alluvium or colluvium, and some rocks (especially clay stone, mudstone and siltstone). The piping process involves a relatively weak, incoherent layer that becomes saturated and conducts water to some free face which transects this layer. The free face could be the wall or head of a gully, the head cut of a landslide, or a manmade excavation. Even though the pipe may be small when it first develops, it forms a conduit more permeable than the surrounding material. .

OBJECTIVES OF THESTUDY

The project aims at achieving the following objectives:

- To understand the mechanism governing soil piping
- To investigate the possibility of applying bio abatement to reduce soil piping

- To study the piping in different types of soil
- Comparison between synthetic and bio-abatement

SCOPE OF THESTUDY

Formal inclusion of the effects of piping on slope evolution presents a number of major problems at our current state of knowledge. Scope of this project was to investigate the mechanisms governing the progression of piping erosion in different types of soils and attempted to use the findings to reduce the severity of piping erosion. The hypothesis was that the presence of organics within mineral soils results in a reduction in piping erosion progression. Erosion behaviors of the soils were quantified using a simple erosion test with a preformed hole to simulate an initial piping channel.

- Improving soil stability
- Enhancement of vegetation
- Reduce landslide and massive destruction
- Eco friendly and economical
- Enhances nutrients in soil

MATERIALS USED

The various materials used in the experimental program were described below

1. Sand

The sand chosen for the study was obtained from IES College of Engineering, Chitil appilly and it is shown in figure 2. The sand was air dried for conducting all the laboratory tests. The grain sized is attribution was found using IS: 2720-part4.For conducting direct shear test this and was sieved through 4.75mm IS sieve.

Fig.2 Sand

2. Kuthiran Soil

Landslides continued for the second consecutive day on the face of the Kuthiran. Kuthiran soil is used for erosion Test and it was collected from kuthiran, Thrissur (Fig.3).Air dried soil samples were used.

Fig.3 Kuthiran Soil

3. Peat Soil

Peat soil (Organic soil) is a soil that is created by the decomposition of plant and animal materials to create a nutrient and mineral rich mini-ecosystem with microorganisms that feed and breathe life back into the soil. The organic soil was collected from kallur, Thrissur (Fig.4).

Fig.4 Peat Soil

4. Versicular Arbiscular Mycorrizhe

A carbuncular mycorrhizae (Fig.5) is a symbiont fungus penetrates the cortical cells of the roots of a vascular plant forming arbuscules. The hyphae of arbuscular mycorrhizae fungi produce the glycoprotein glomalin, which may be one of the major stores of carbon in the soil. Glomalin-related soil proteins (GRSPs), are a significant component of soil organic matter and act to bind mineral particles together, improving soil quality.Glomalin is hypothesized to improve soil aggregate stability and decrease soil erosion.

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Fig.5 Vesicular Arbiscular Mycorrizha

5. Modified Starch

Modified starches (Fig.6) are plant-based ingredients. Derived from cereals (maize and wheat) and tubers (potatoes). They belong to modified polysaccharides. Starches are modified to enhance their performance in different applications such as increase their stability against excessive heat, acid, shear, time, cooling etc

Fig.6 Modified Starch

I. EXPERIMENTAL SETUP

Fig.7 shows the experimental setup. The mould is 70 mm in diameter and 140 mm in length. Clear acrylic tubing and end caps were used for the specimen mold and allowed for easy observation of the specimen unhindered from the specimen for collection within buckets directly beneath the specimen. The test setup borrowed the concept of the constant-head hole erosion test (HET), which was originally developed by Wan and Fell.

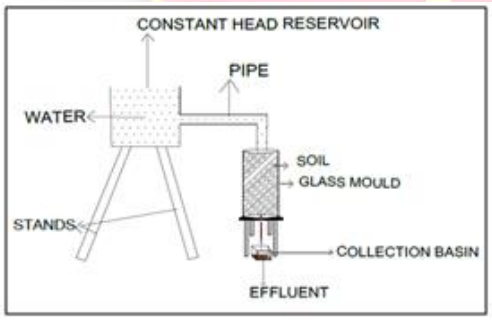

Fig.7 Erosion Test Setup

The purpose of this research was to develop an understanding of some of the fundamental mechanisms governing erosion in soils, with the ultimate goal of developing improved methods For resisting erosion in hilly areas like kuthiran, Thrissur, through a biologically as well as synthetically derived erosion reduction technique, which is referred to here as bio abatement and synthetic abatement respectively.

RESULT AND DISCUSSION

The tests for index properties and engineering properties of soils were determined by conducting series of laboratory experiments.Thebasicpropertiesofthesandweredeterminedasper ISspecificationsandtheresultsaregivenin the table.1.

Table.1BasicPropertiesofSand

Properties	Value
Uniformitycoefficient, C_u	3.29
Coefficient ofcurvature,C_c	1.70
Gradationofsand	SW
Specificgravity	2.65
Max.drydensity(g/cc)	1.775
Min.drydensity(g/cc)	1.747
Sanddensity(Dr-30%)	1.755
(Dr-50%)	1.760
(Dr-70%)	1.766
Permeability(cm/sec)	$7.30X10^{-4}$

Table.2 shows properties of Kuthiran soil from various laboratory tests.

Table.2BasicPropertiesofKuthiranSoil

Table 3 shows properties of Peat soil from various laboratory tests.

Table.3BasicPropertiesofPeatSoil

PROPERTIES	VALUES
Specificgravity	1.895
Sieveanalysis,Cu	9.75
Liquidlimit	59%
Flow index	22%
Plastic Limit	49%
Plasticityindex	10%
Maximumdrydensity(g/cc)	1.38
Optimummoisturecontent	29%
Permeability (cm/s)	$2.26x\ 10^{-4}$
Undrainedshear strength	$25.2kN/m^2$

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EROSION RATE

By conducting constant head hole erosion test in each type of soil samples by adding modified starch and versicular arbiscular my corrizhae.

SAND

The erosion rate of sand is represented graphically in fig.9. By adding various percentage of modified starch in sand, the erosion rate is varied. The minimum erosion rate is obtained 16% corresponding to 24% of modified starch.

In case of versicular arbiscular mycorrizhae, the erosion rate is reduced to 13% corresponding to 12% versicular arbiscular mycorrizhae.

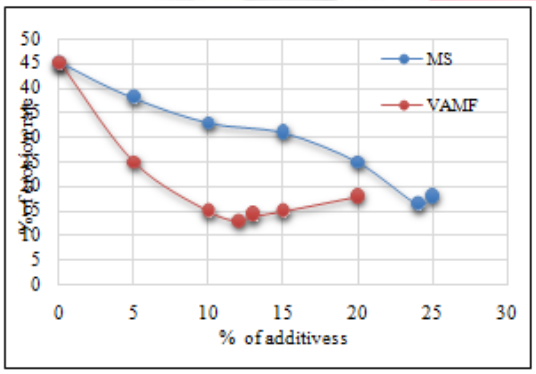

Fig.9: Erosion Rate of Sand

KUTHIRAN SOIL

PROPERTIES	VALUES
Specificgravity	2.28
Sieveanalysis.Cu	11.05
Liquidlimit	45%
Flow index	9%
Plastic Limit	15%
Plasticityindex	17%
Maximumdrydensity(g/cc)	1.615
Optimummoisturecontent	25%
Permeability (cm/s)	7.45×10^{-4}
Undrainedshear strength	55.4 kN/m^2

The erosion rate of kuthiran soil is represented graphically in fig.10. By adding various percentage of modified starch in soil, the erosion rate is varied. The minimum erosion rate is obtained 9% corresponding to 10% of modified starch.

In case of versicular arbiscular mycorrizhae, the erosion rate is reduced to 5% corresponding to 3% versicular arbiscular mycorrizhae.

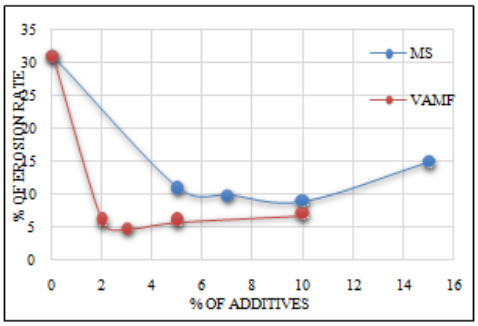

Fig.10: Erosion Rate of Sand

- PEAT SOIL

The erosion rate of peat soil is represented graphically in fig.11. By adding various percentage of modified starch in soil, the erosion rate is varied. The minimum erosion rate is obtained 5.3% corresponding to 2% of modified starch.

In case of versicular arbiscular mycorrizhae, the erosion rate is reduced to 3% corresponding to 2% versicular arbiscular mycorrizhae.

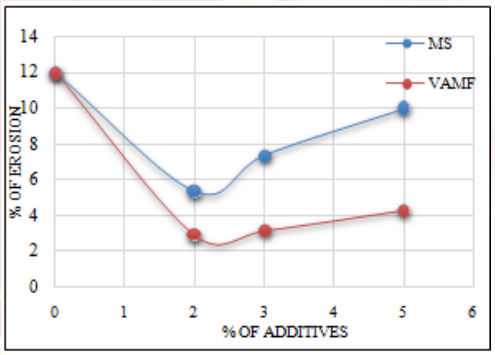

Fig.9: Erosion Rate of Peat Soil

By comparing the erosion results, the versicular arbiscular mycorrizhae has better effect compared to modified starch. That means soil piping can be mainly reduced by adding VAMF. From the 3 soil specimens, peat soil has less erosion rate. Because they contains organic matter more.

The erosion index in each soil corresponding to the percentage of additives shown in the table.4.

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Table.4: Erosion Index

SAMPLES	0% Additives	M S (%)	VAMF (%)
Sand	45	16	13
Kuthiran Soil	31	9	5
Peat Soil	12	5.3	3

The figure.12 shows the graphical representation of erosion index in each soil corresponding to the percentage of additives.

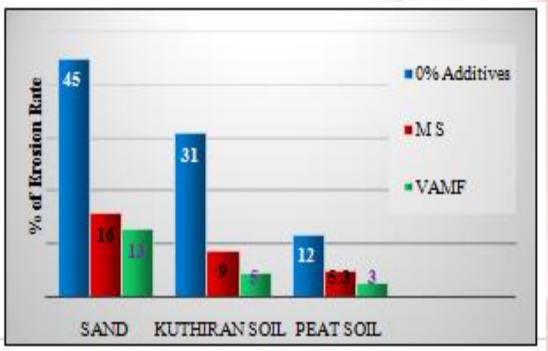

Figure.12: Erosion Index

CONCLUSIONS

The additives improve the resistance to the soil piping. By conducting the constant head hole erosion test using the additives like MP and VAMF obtained the following results

- ✓ Erosion resistance increased by adding the additives such as MS and VAMF
- ✓ Comparing with MS, VAMF shows more erosion resistance
- ✓ Top surface soil permeability decreases
- ✓ Slope stability increases thereby reduce landslides
- ✓ Soil piping can be controlled by improving soil particles interaction

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COVID19 STATISTICS DISPLAYING WEB PROTAL

Swathi. S [1], Sanjeev. M[2], Rajesh Kannan. S[3], Arun Anoop M. [4]
[1,2,3]UG Student, [4]Assistant Professor,
[1,2,3,4] Department of Computer Science and Engineering,
[1,2,3,4] Sri Shakthi Institute of Engineering and Technology, Coimbatore,Tamilnadu, India

ABSTRACT: ***The recent natural event of covid has taken the globe rapidly, forcing lockdowns and straining public health care systems. This pandemic disease is thought to be an extremely infectious virus; infected people do not at first exhibit symptoms, whereas some stay symptomless. In response, several governments have shown nice interest in smart phone contact tracing apps like Aarogya setup [India] that facilitate modify the tough task of tracing all recent contacts of new known infected people. During this paper, as the primary analysis, we have collected some API's is to extract pandemic illness, covid information from several websites, and ultimately, we tend to propose a picture model, that extracts covid-19, the pandemic disease information supported daily or weekly and it is focused to show countries of the world, state, and district wise affected or active or dead rate live data automatically with the assistance of various API's.***

KEYWORDS: ***Covid-19, API (Application Programming Interface), data visualization, AI (Artificial Intelligence), data extraction, Chatbot.***

INTRODUCTION

Data extraction is that the act or method of retrieving data from sources for more processing or data storage. The import into the intermediate extracting system is therefore sometimes followed by data transformation and presumably the addition of information before export to a different stage within the data workflow. An API is a collection of programming code that allows data transmission between one product and another. It conjointly contains the terms of this data exchange. Infecting seventy million individuals and inflicting over 1,000,000 deaths (WHO Corona virus disease (COVID-19) Dashboard, 2020), COVID-19 has verified to be a significant threat to human health, production, life, social functioning, and Peacekeeping. Given the virus's profound negative effects on the planet through the numerous forced lockdowns, fighting back against it's of the foremost essential importance. Within the fight against COVID-19, massive, big technologies have competed for a crucial role in several aspects, as well as the speedy aggregation of multi-source big data, rapid visualization of epidemic data, and abstraction chase of confirmed cases, among others (Zhou et al., 2020). However, the most challenge is finding methods to regulate ancient knowledge analysis ways and improve the speed and accuracy of the data provided. Concerning the continued pandemic, we tend to face Associate in nursing "infodemic": a mass unharnessed of COVID-19 connected data creating it troublesome to navigate through and perceive. Owing to this "infodemic", researcher's area unit given with three major problems. First, the data's convenience and presentation are usually terribly inaccurate. Second, information is sometimes fragmented into static snapshots, preventing the viewer from seeing the larger image of cases over time. Many COVID-19 chase maps presently exist; sadly, none of them can gift purposeful, timeframe freelance information. Consequently, researchers cannot perform an Associate in Nursing correct and perceptive analysis of the unfold of the virus over time. Third, most knowledge visualizations area units terribly inefficient, creating it troublesome to make multiple visualizations with one model and impractical to copy by alternative researchers. Keeping each of the aforesaid problems in mind, a way to with success produce correct and perceptive visualizations was developed. To make sure accuracy among this technique, knowledge from a prestigious supply was used. To create this technique as economical as attainable, KNIME, an advanced analysis tool, was wont to produce a model file that would be emended with user parameters to simply replicate the method for multiple

totally different countries. What is more, most visualizations concerning country cases of COVID-19 area unit at a national level. In alternative words, there is a scarcity of visualizations out there for regional and provincial impacts of COVID-19 among any given country, except the United States of America. Currently, there is much proof suggesting that effective maps will aid the bar of microorganisms to unfold. Given the relevancy and acceleration of COVID-19, this study targeted on making replicable and economical workflows that make visualizations to grasp the unfold of COVID-19, verify the accuracy of alternative models, promote information and knowledge sharing, produce analysis collaborations with alternative researchers, develop pilot studies on COVID-19 for future analysis, cultivate skilled data analysis. The covid eruption was reported to initially originate from the city, China, it has been declared as a Public Health Emergency of International Concern on 30 January 2020 by UN Agency, and it unfolds to over 180 countries by the time of this paper were being composed[17]. Because the disease spreads around the globe, it is evolved into a worldwide pandemic, endangering the state of world public health, and changing into a significant threat to the worldwide community. To combat and forestall the unfold of the disease, all people ought to be intelligent of the speedily dynamical state of covid. Within the endeavor of accomplishing this objective, a covid period analytical tracker has been designed to supply the newest standing of the disease and relevant analytical insights. Our covid tracker is meant to cater to the general audience whereas not advanced math ability with real-time data. It aims to talk insights through varied straightforward and cryptic data visualizations that square measure supported by reliable data sources. Covid shook up the roots of the planet. India was the foremost appalled of all the countries of the planet, as it was the foremost populated and underdeveloped country. So, it is necessary to make awareness concerning the widespread of the disease. The covid tracker helps to know the results of covid around the world through tabular and graph illustration. It provides elaborate information on each country on the planet and additionally information on all states of India with conjointly every district enclosed.

RELATEDSTUDY

Angular js, firebase, API for the world and India, graph Plotting for visualizing the covid data from the API. The world-wise data and India's data will be viewed in tabular format. The whole application is developed in Angular js and deployed on the worldwide internet through notify. The data we to get through the API are from covid19india.org and corona. imao. ninja. we get the cases, today Cases, deaths, today Deaths, recovered, active, critical, casesPerOneMillion, deathsPerOneMillion, tests, testsPerOneMillion from the API these data are updated each 24 hours. The data from the API will be used to produce a graph to form it to make to know. There is additionally a chatbot, that helps by giving coved info and self-analysis to make the user perceive things regarding covid Web Data Extraction, Applications And Techniques: In this paper, The History of data Extraction is explained alongside primitive techniques. Web Data Extraction is a vital downside that has been studied by suggests that of various scientific tools and during a broad 5 vary in applications. Several approaches to extracting data from the net are designed to resolve specific issues and operate in ad-hoc domains. Internet data Extraction systems square measure a broad category of package applications targeting extracting data from internet sources. Alternative approaches, instead, heavily utilize techniques and algorithms developed inside the sector of data Extraction. The kinds of data extraction with explaining. The data extraction is explained at the side of the real-time use case [10].

An Analysis of Public REST Web Services API's:

This paper self-addressed completely different use cases at the side of along with and implementation of API. Businesses are progressively deploying their services on the net, within the kind of net applications, SOAP services, message-based services, and additional recently, REST services. Though the movement towards REST is widely known, there is not a lot of concrete info relating to the technical options getting used within the field, like typical data formats; however, HTTP verbs are getting used or typical URI structures. Our system tends to analyze these five hundred general APIs for key technical options, degree of compliance with REST architecture, and adherence to best practices. They tend to determine several trends, but, at an identical time, high

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diversity in services, as well as variations in adherence to best practices, with solely zero. Our results will facilitate practitioners to evolve pointers and standards for planning higher quality services and conjointly perceive deficiencies in presently deployed services. Researchers may enjoy the identification of key analysis areas, causative to the preparation of additional reliable services [18].

Methodology for the Implementation of Virtual Assistants for Education Using Google Dialog flow:

This paper is based on the operating principles and functions of Google dialog flow. They tend to develop a virtual assistant that enables students to access interactive content custom-made for an introductory undergraduate course on AI. This Chabot is a very positioned ready to point out answers to commonly asked queries in a graded structured manner, leading students by either voice, text, or tactile input to the content that higher solves their queries and doubts. It had been developed using Google Dialog flow as a simple way to generate and train a natural language model. Another convenience of this platform is its ability to gather usage data that are potentially helpful for lecturers as learning indicators. At the instant, many articles, news, and blogs are writing concerning the potential, implementation, and impact chat bots normally have contexts, but there is very little to no literature proposing a strategy to breed them for academic functions. Therein respect, they developed four main classes as a generic structure after all content and centered on fast implementation, simple change, and generalization. The ultimate product received a general approbation of the scholars due to its accessibility and well-structured data [19].

Data Mining:

Web Data Mining Techniques, Tools and Algorithm In this paper, the conception of data Mining is explained with its sorts besides the working rule. Web data mining became a simple and necessary platform for the retrieval of helpful info. Users like the Worldwide internet additional to transfer and transfer knowledge. With the increasing growth of data over the web, it's obtaining tough and time 7 overwhelming for locating informative data and patterns. Creating by removal knowledgeable and user queried info from unstructured and inconsistent knowledge over the net is not a simple task to perform. Completely different mining techniques square measure wants to fetch relevant info from the internet (hyperlinks, contents, internet usage logs). Internet data processing may be a sub-discipline of data mining that in the main deals with the internet. Internet data processing is split into 3 completely different types: internet structure, website, and internet usage mining. Of these sorts used completely different techniques, tools, approaches, algorithms to discover info from vast bulks of knowledge over the net [15].

Data Visualization:

This paper focuses on data visualization with techniques to implement graphs and charts for visualizing the information. Knowledge data involves presenting data in graphical or pictorial kind that makes the data simple to grasp. It helps to clarify facts and verify courses of action. Data visualization is additionally considered info mental image or scientific mental image. People, in general, have continuously used visualizations to create messages or info last in time. What cannot be touched, smelled, or tasted are often described visually. It will profit any field of study that needs innovative ways that of presenting giant, complicated info. The appearance of lighting tricks has formed trendy visualization [21].

Artificial Intelligence:

A modern approach addresses the ways in which to create and implement AI primarily based models. Authors mentioned a few of the foremost necessary aspects related to AI during which it will facilitate a higher understanding of Artificial Intelligent and each its benefits and downsides to be able to shield ourselves from the future technological trend. They also will discuss several about the algorithms employed in AI systems. AI these days is being enforced in nearly every field of study through many models like SVM and ANN. They should always be able to proceed with knowing and understanding the results of each technological trend. They tend to show within the AI revelation era and, therefore they should always adapt to this transformation and welcome it too by grasp AI and moving toward an improved society [20].

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Scraping

Web scraping or harvesting or data extraction is a process of extracting content and entire data from a website which we mentioned in a program. It results the replication of entire website content. Based on the study, web scraping consists of functions like some importing concepts of XML, HTML, FEED and DATA in the case of Google sheets. And it has some plugging like NodeJs and PhantomJS is to collect and parsing. This web scraping main aim is to automate the process of continuous copying and pasting data from various websites. OCTOPARSE is a web scraper method some firms utilized for COVID based web scraping. Commonly used websites are, covidindia.org, oneindia.com, mygov.in to extract covid daily statistics. Web scraps are parse hub, scrappy, octopuses, scraperAPI, Mozenda. A primer evaluation done in site scraping (collecting or hacking Google by site scraping, only for research evaluation) is mentioned below,

www.google.com

site: <web address> “gmail.com” OR “yahoo.com”

Copy all results and paste those results to email extractor [10] input field and press Extract button to get all the mail ids in output field.

Fig. 3.1: Site Scraping [10]

Fig. 3.3: Scrappy [12]

Fig. 3.4: Mozenda[13]

Fig. 3.5: ScraperAPI[14]

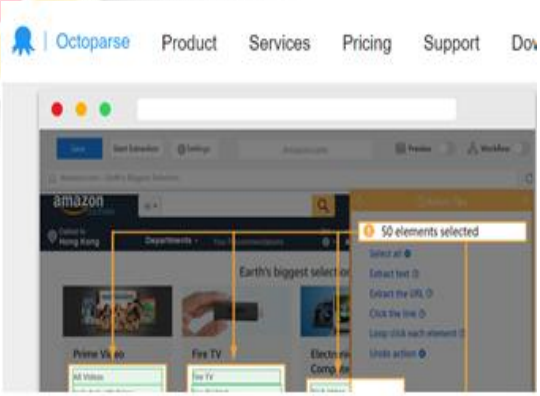

Fig. 3.6: Octoparse [15]

PROPOSED SYSTEM

The covid tracker uses a prime API that is updated frequently. It shows all the necessary covid details in tabular format and also the required details in graphical illustration, which is simple to grasp. Most of the option and data that are out there in the covid tracker is straightforward to use and to perceive. It additionally offers elaborate data on the desired details. It is additionally integrated with a chatbot that offers covid info and will do the self-analysis to the user making it quite interactive.

MODULEDESCRIPTION

A Web API is employed to send your request for that keyword to an internet server, and reciprocally, the server provides reviews or comments to you in an exceeding data format. Raw format knowledge does not essentially look easy like spreadsheet rows and columns. An application programming interface (API) may be a set of software system definitions, protocols, and tools for building an application package. Generally, terms, it's a group of clearly outlined ways of communication between numerous package elements. Our APIs are from https://corona.lmao.ninja/v2/countriesand https://api.covid19-api.com/country/ that extract data in JSON (JavaScript Object Notation) format. JSON is that the language of API's. JSON is the procedure for writing in code knowledge structures that ensure that they're simply legible by machines. JSON is that the primary format during which knowledge is passed back and forth to API's, and most API servers can send their responses in JSON format.

The covid tracker can be accessed through this link https://covid-hub.netlify.app/.

The first thing it shows is the home page, where the users can select the login/signup option. While new users can, signup and previous users will login.

The data are validated when signing up and are evaluated during login.

Fig. 5.1: Home Page

Fig. 5.2: Sign Up Page

Fig. 5.3: Login Page

After login, the user can access the dashboard and the intercountry data from the home page.

Figure 5.4: Home Page of web portal

The Dashboard consists of the world covid data intabular format, where the user may also choose the specific country from the drop-down menu to see the graphical visualization of the chosen country.

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Fig. 5.5: Details of COVID Tracker

Fig. 5.6: Dashboard Selection Of Countries

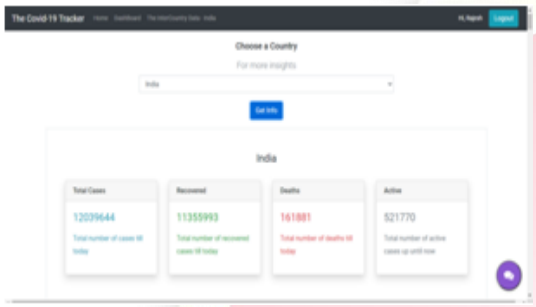

Fig. 5.7: Data Visualization of country wise total report

Fig. 5.8: Data analysis

The inter-country data consist of all the states of India in the drop-down menu, Where the user can select the specific state and it will show district-wise data of that state.

Fig. 5.9: Inter-Country Data Selection

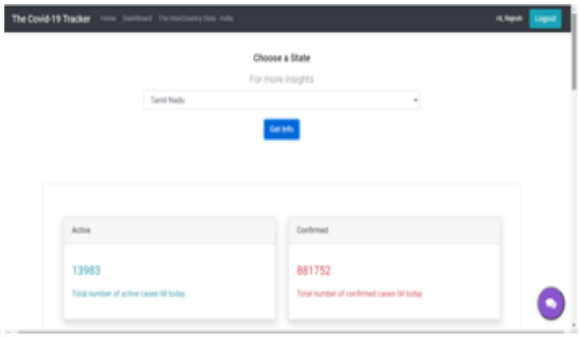

Fig. 5.10: Data Visualization Active and Confirmed Patient's data

Figure 5.11: Total Report Data Visualization

There is an icon on the bottom right corner, which is a chatbot. This chatbot will offer basic covid info and can also do self-analysis for the user.

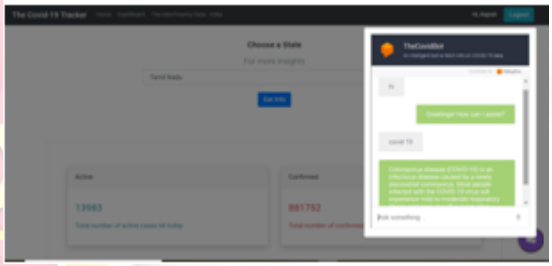

Fig. 5.12: Chatbot Framework

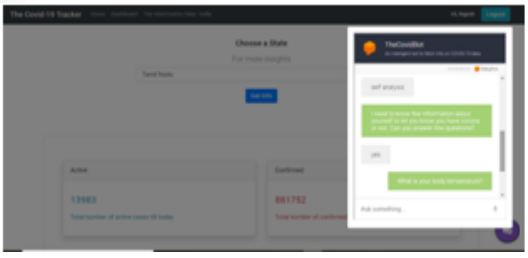

Fig. 5.13: Chatbot Self-Analysis

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CONCLUSION

The covid tracker aimed to supply a user-friendly dashboard that provides real-time data regarding covid around the world and India. This covid tracker provides data in Tabular format and standing data within the style of interactive graphs. The awareness is additionally created amongst the guests using the messages displayed within the website. The covid tracker can display state, district-wise live covid data of India and conjointly covid data of countries automatically with the assistance of 2 totally different APIs. There is conjointly an artificial intelligence-based mostly chatbot that guides individuals to understand a lot of details relating to this pandemic disease. In future, we add district wise information with daily and weekly report.

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Evaluation of Strength of Bituminous Pavements with and without Natural Fibers

Athulya Varghese[1], Naeema Amina Najeeb[2], Hasnath Sharraj[3]
[1,2,3]PG Student, Department of Civil Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala, India

Abstract - The technology and use of bituminous materials and mixtures were first discovered and mostly used in European countries and North America. Bituminous compound is a compound that is characterized by high coarse aggregates, high bitumen content, and fiber additives as stabilizers. In this current research, an attempt has been made to study the engineering properties of mixtures of bituminous compounds with and without fiber. Here, the fiber used is non-traditional natural fiber, i.e. bananas. This research was carried out to test the banana mixture as a stabilizing agent by analyzing the mixing parameter and consistency through laboratory tests. Aggregate gradation is based on the MoRTH specification for the bituminous mixture, and is 0% -0.3% depending on the total weight of the fiber. Here the stone powder is used as a filler and the binder is 60/70 grade bitumen.

Keywords: - bituminous mixture, flow parameter, stability, additives.

INTRODUCTION

India, being the second largest growing economy in the world, in part with other developmental activities, road infrastructure has been developing at a very fast rate. The spurt in the growth of traffic and overloading of vehicles is decreasing the life span of roads laid with conventional bituminous mixes. This also leads to the reduction in the riding qualities resulting in exorbitant vehicle operating costs and frequent is maintenance interventions due to premature failure of pavements. Providing durable roads are always a problem for a country like India with varied climate, terrain condition, rainfall intensities and soil characteristics

Bituminous mixes are using in surface layers of the road and pavements. The mix is composed usually of bitumen and Aggregate. Some types of bituminous mixes are also to be used in base course. The design of asphalt paving mix, along with the design of other engineering materials is largely a matter of selecting and proportioning constituent materials to obtain the desired properties in finished pavement structure. Pavements constructed with bituminous materials are economically easy and quickly. Some of the disadvantages of bituminous pavement were Bituminous pavements are durable, with less stress compared to concrete pavements, harsh weather and inappropriate weather make the bituminous pavement soft and smooth, causing contamination in contaminated and polluted bitumen soils, thus melting groundwater. Also the current pavements have poor resistance to cracking, poor riding quality, improper water drainage, increase in no of dusty roads, increase in cost of construction by the use of synthetic fiber. The concept of using natural fiber and waste materials to replace these energy intensive synthetic fibers is a recent development in this field. India, being an agricultural economy produces the fairly huge quantizes of some natural fibers such as banana, sugar cane, jute, coconut, sisal etc. Now- days the disposal of plastics is a major concern for an eco-friendly sustainable environment. In line with these thoughts, we recently utilize the natural fibers and waste plastics as additives to improve the performance of bituminous mix. Hence we suggest the banana fiber as additive to improve the qualities of the bituminous pavement.

OBJECTIVES

The major problems faced by bituminous pavements are poor resistance to cracking, poor riding quality and drain down of the bituminous mix, improper water drainage and increase in no: of dusty roads and increase in cost of construction by the

use of synthetic fibers, these problems may be resolved in our project through the following objectives

- Determine the feasibility of the natural fibers in bituminous pavements
- Find out the optimum bitumen content corresponding to the design air voids.
- Shear strength and tensile strength by increasing the fiber content.
- Comparing the stability of conventional mix with and without fibers

FUTURE SCOPE

Many properties of bituminous mixes such as Marshall Properties and drain down Characteristics have been studied in this investigation. Only 60/70 penetration grade bitumen and a modified natural fiber called banana fiber have been used in this investigation. Nonetheless, some of the properties such as fatigue properties, moisture susceptibility characteristics, resistance to rutting and dynamic creep behavior can again be investigated. Some alternative synthetic and natural fibers and other type of binder can also be used in mixes and correlated. Banana fiber used in this study as a low cost material; therefore a cost-benefit analysis is effect on cost of construction. Moreover, to ensure the success of this new material, experimental structure may be constructed and periodic performances monitored.

MATERIALS

Banana fiber

Bananas are a multicellular fiber. The suitability of fiber for use in products can be determined by the degree of polymerization of cellulose. It is a cellulose-rich fiber (70%) with low lignin content (12%). The most important mechanical properties of fiber are tensile strength, elongation, and density. The high tensile strength exhibited by the fiber indicates resistance to wear and tear, making it suitable for use on sidewalks. The physical and chemical properties of different fibers have been observed to be the highest for single fiber stability, fiber bundle stability, fiber porosity and moisture recovery compared to other plant parts from fiber bundles. Fiber extraction is usually done by hand or by mechanical means. Bananas have good special properties that can be compared to traditional materials such as glass fiber. Bananas have a higher density than glass fiber. Alkali treatment has been shown to be effective in removing impurities from fibers, reducing moisture, enabling mechanical bonding and thereby improving matrix strengthening interventions.

Table 4.1. Properties of banana fiber

PROPERTY	VALUE
Diameter (μm)	80-250
Density (g/cm^2)	1.35
Cellulose content (%)	65
Liginin content (%)	5
Elastic modulus (GN/M^2)	80-120
Elongation at break	1.0-1.2

Aggregates

For preparation of bituminous mixes physical properties of coarse aggregate in table 4.2.

Table 4.2. Physical Properties of Coarse aggregate

PROPERTY	TEST METHOD	TEST RESULT
Aggregate Impact Value (%)	IS: 2386 (P IV)	14.3
Aggregate Crushing Value (%)	IS: 2386 (P IV)	13.02
Los Angels Abrasion Value (%)	IS: 2386 (P IV)	18
Flakiness Index (%)	IS: 2386 (P I)	18.83
Elongation Index (%)	IS: 2386 (P I)	21.5
Water Absorption (%)	IS: 2386 (P III)	0.1

Binder

Here 60/70 penetration grade bitumen is used as binder for preparation of mix in Table 4.3.

Table 4.3. Properties of Binder

PROPERTY	TEST METHOD	VALUE
Penetration@25°C	IS : 1208-1978	94
Softening Point (°C)	IS : 334-1982	45.25
Specific Gravity@27°C	IS : 1202-1978	1.2977
Ductility @27°C	IS : 1208-1978	94

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METHODOLOGY

Drain down test

This experimental method involves determining the reduction of drainage in the uncompressed bituminous mixture when the Sample is held at different temperatures between mixing, production, storage and transportation. Drain test is performed on bituminous mixes to assess the drain percentage of binder used in the mixture. Drainage tests performed on bituminous mixes show that not all mixtures with fiber flow down from the binder. Adding 60/70 bitumen mixture to the fiber gives the best result. In this study, the bituminous mixtures obtained in the optimal binder content are examined for drainage. Drain down tests is performed on the flexibility of mixtures with optimal binder content to establish that the drainage property of bituminous mixtures is at acceptable levels. Samples are tested using three-dimensional samples for each style mix, each consistent and non-additive. The mass of the loose mixture sample, so the initial mass of the pan is set closest to 0.1g. The basket is placed in the pan and the assembly is placed inside the kitchen appliance for 1 hour (175 C), and when the sample is inside the kitchen appliance for one hour, the basket is then removed from the pan so that the final mass is set in the pan and the nearest 0.1 g is recorded.

Fig.5.1.1. Drainage of 60/70 bitumen sample without fiber

5.2 Marshall test

The experiment was invented in the United States by Bruce Marshall of the Mississippi Highway Department to design road sidewalks made of bitumen. The device consists of cylindrical axes of 10.16cm diameter and 7.62cm high base plate and collar. It contains 4.54 kg of hammer with a drop of 45.7 cm. Jack loading, oven or hot plate, mixing device, water bath and thermostat are a common bituminous mixture to provide a uniform loading of 5.08 cm per minute for pedestrians, breaking heads; It includes coarse, fine aggregate, filler and bituminous barriers. Fillers are used to increase the density and to fill the void in the bituminous mix, and bituminous binders are used to bond the materials because this bituminous mixture is used as the surface texture of the flexible pavement.

Fig.5.2.1. Marshall Test in Progress.

Fig.5.2.1. Marshall Sample.

RESULT AND DISCCUSIONS

Test result from drain down Test

From the study of the drainage of bituminous mixtures, it can be concluded that the bananas used for the present investigation act as an effective stabilizing agent. The role of fiber is to harden the mixture and thereby reduce the drainage of the mixture at high temperatures during storage, transport and compaction of bituminous mixtures. Due to the rich binder content the control mixture is subjected to heavy

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effluent. This strongly supports the need for additives in bituminous mixtures. Drainage of the banana mixture is brought to the specified level.

Table 6.1 Result from drain down test

% Fiber	0	0.1	0.2	0.3	0.4
Drain down (%)	6.4	2.6	0.2	0.01	0.003

Test result from Marshall Test

Marshall Stability and Flow Value from Table 6.2, it is clear that the presence of fiber in bituminous mixtures effectively improves the stability values, which can lead to an improvement in the hardness of the mixture. This result

Suggests that mixing with bananas will result in a higher performance wing control mix. The stability of fiber-stable compounds initially increases and reaches a maximum value and then the fiber content decreases. Bituminous composite is an incompatible, non-uniform multi-faced composite material containing aggregates and sticky bitumen. So that the excess fibers do not scatter evenly. As a result, stability decreases at high fiber content. It should be noted that all fiber stability compounds provided maximum stability at 0.3% optimum content. Banana fiber blends have high stability, indicating their high resistance and excellent performance. The flow value of bituminous mixtures decreases after the addition of fibers. Due to the hardness of the fibers in the mixture, the alloys become more flexible and the resistance to deformation increases, resulting in a lower flow value. However, flow values range from 2 to 4 mm (AASHTO T 245) within the required specification range. Bulk specific gravity decreases in bituminous mixture. Considering the fact that high specific gravity results in better design, it can be assumed that banana fiber stable blends perform better. Excessive air vacuum in the mixture can cause cracking due to inadequate bitumen binders, so coat in aggregates, while very low air vacuum can lead to more plastic flow (routing) and bitumen bleeding. After adding fibers to the bituminous mixtures, the air vacuum here increases. This may be due to the networking effect of the fiber within the mixture. However, the air vacuum of the composites is in the range of 3% to 5% (AASHTO T 312) specification that supports fiber consumption. Increasing the fiber content increases the VMA of bituminous compounds and decreases VFB. While the fiber content increased from 0% to 0.3%, banana fiber stable compounds had a vacuum of 4.36%, 20.12% VMA and 78.33% VFB compared to the control mixture. The results are within the required specification range, which also supports the use of these additives.

Table 6.2 Variation of Marshall Properties with different % of banana fiber

Fibre content	% of fiber	stability	Flow value	Air voids	Bulk specific gravity	VMA	VFB
Without fibre	0	7.214	3.20	4.20	2.32	18.86	78.82
With fibre	0.1	7.690	3.18	4.11	2.31	19.34	78.79
	0.2	8.543	3.12	4.23	2.29	19.72	78.58
	0.3	10.980	2.87	4.36	2.28	20.12	78.33
	0.4	8.410	2.61	4.52	2.27	20.44	77.98

CONCLUSIONS

From this study, by adding 0.3% of fiber properties of Mix is improved in all cases and showed a better performance in the mix. It is concluded that the bituminous mix with banana fiber is suitable for road construction at a moderate temperature than mix without fiber. Banana fiber taken for this study is a low-cost material; therefore cost-benefit analysis knows its effect on the cost of construction. From the Marshall and drain down test, it is concluded that bituminous mix using banana fiber gives good shear and tensile strength and can be used in flexible pavement. It also improves the characteristics and service life of bituminous surfacing, eventually leading to the conservation of construction materials. It improves resistance to cracking, riding quality, improper water drainage, decreases the no; of dusty roads. Hence reduces the pollution. Bituminous pavements are less durable and have low tensile strength as compared to concrete pavements. By adding additives these problems can be resolved. From the drain down sensitivity test, we can conclude that the potential effects of the inclusion of additives in bituminous mixtures are beneficial in preventing the bleeding phenomenon of the mixtures and the drain down of mix. The role of the additive is to harden the mastic and thereby reduce the drainage of the

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mixture at high temperatures during storage, transport, placement and compaction of the bituminous mixture. The bananas used in the bituminous mixture for the current investigation act as an effective stabilizing agent and provide significant stability to the mixture compared to the control mixture. Due to the gap grading and the rich binder content, the control mixture is subjected to a 6.4% heavy drain, which is 0.3% above the specified limit depending on the weight of the mixture. The presence of additives in the bituminous mixture brings the drainage of the mixture to a certain level. This again supports the need for additives in bituminous mixtures, as we can conclude from the Marshall Stability Test that net vacuuming increases the air vacuum of bituminous mixtures after the fibers have been added to the mixing effect of the fibers within the mixture. The air vacuum of all mixtures is within the required specification range of 3 to 5% (AASHTO T 312) which supports the use of these mixtures. Increasing the fiber additive content in the bituminous mixture increased the voids in mineral aggregate (VMA) and a reduction in voids filled with bitumen (VFB) values, which also supports the use of these additives. The bulk specific gravity of the mixture slightly decreases with the addition of fiber additives. This is due to the variations in air voids in the mixture as well as compared to the control mixture. With the increase in the percentage of additives in the bituminous mixture, Marshall Stability values increase concerning the control mixture showing its better resistance against the permanent deformations. The maximum values for these properties are obtained at 0.3% fiber content. Beyond this percentage of banana fiber, the results show a decreasing trend. The flow value of bituminous mixtures decreases due to the addition of banana fiber. The mixtures become less flexible, resulting in a lower flow value. Flow values are in the required specification range of 2 to 4 mm (AASHTOT 245) which supports the use of additives in bituminous mixtures.

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Study on Bio-packing of Waste in Soil by implementing P-Gram Negative Bacteria and Low Permeable Reactive Barrier

Anina P Jose[1], Anju R Nair[2], Jerin K Lazar[3], Seemon S[4]

[1,2,3]PG Student, Department of Civil Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala, India
[4]Assistant Professor, Department of Civil Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala, India

Abstract – The expanding use of plastics for various applications such as packaging, construction, automotive industry, agriculture, etc. is associated with a negative environmental impact due to the large amounts of the generated plastic wastes. Biodegradation in soil could be an interesting option in applications where waste recovery is impossible or in cases when disposal to soil is an intentional end-of-life option This study mainly aimed on biopackingof waste in soil by applying microorganism and low permeable reactive barrier. The degradation of polythene materials in soil is done by microorganisms called Pgram negative bacteria and zero valent iron used as reactive media in low permeable reactive barrier.Onanalysing results from column studies and lab experimenst conducted in various samples this method of disposal is environmentally acceptable.

Keywords: p-gram negative bacteria,zero valent iron

INTRODUCTION

Plastic pollution has become one of the most pressing environmental issues, as rapidly increasing production of disposable plastic products overwhelms the world's ability to deal with them. Plastic pollution is most visible in developing Asian and African nations, where garbage collection systems are often inefficient or non existent. But the developed world, especially in countries with low recycling rates, also has trouble properly collecting discarded plastics. The conveniences plastics offer, however, led to a throw-away culture that reveals the material's dark side: today, single-use plastics account for 40 percent of the plastic produced every year. Many of these products, such as plastic bags and food wrappers, have a lifespan of mere minutes to hours, yet they may persist in the environment for hundreds of years. Use of polythene is increasing day by day and now it can be seen that polythene is being used in almost every activity of life. It has been estimated that India's polythene demand is expected to increase by 129 % by 2023. Currently, there are three main methods for plastic waste handling: burying in landfill, incineration and recycling .Each has its own inherent limitations. Among all other methods biological degradation appears to be the most promising method.Pgram negative bacteria utilize the polythene as source of carbon and use their enzymatic machinery to solubilize it. When wastes containing BPA are disposed of in land, hydrolytic or leaching processes may occur and BPA can therefore be released from these wastes to the leachate. It is well known that the behaviour of organic contaminants in land is influenced by the combined effects of biodegradation, sorption and transfer in the gas and/or liquid phases .A permeable reactive barrier (PRB), also referred to as a permeable reactive treatment zone (PRTZ), is a developing technology that has been recognized as being a cost-effective technology for in situ (at the site) groundwater remediation. PRBs are barriers which allow some but not all materials to pass through. One definition for PRBs is an in situ treatment zone that passively captures a plume of contaminants and removes or breaks down the contaminants, releasing uncontaminated water. The primary removal methods include: sorption and precipitation, chemical reaction, and reactions involving biological mechanisms. Nanosized zero-valent iron (nZVI) is an emerging material in

these fields due to its high reactivity and expected low impact on the environment .On combining the polythene degrading bacteria and a low permeable reactive barrier in soil will help in safe disposal of polythene waste.

II.OBJECTIVE OF THE STUDY

This project aims on proper disposal of waste like a trench landfill by incorporating polythene waste degrading bacteria accompanied with a low permeable reactive barrier .Commercial plastic material were tested for soil biodegradation after addition of p gram negative bacteria into soil and also determined leachate characteristics after providing a low permeable reactive barrier in the specimen. Emphasizing on column test the relevance of packing waste in soil is being proved.

- To determine index properties of various soil collected from field.
- To determine compaction characteristics of soil by adding polythene waste
- To determine the effect of reactive media in soil against ground soil contamination

SCOPE OF THE STUDY

On adapting proper type of dumping method we can confine waste to as small an area as possible. Incorporation of Pgram together with LPRB is an economical way of dumping waste which will be a solution to various environmental and health hazards. Biodegradation is an attractive alternative to current practices for waste disposal, as it is generally a cheaper process, potentially much more efficient and does not produce secondary pollutants, such as those associated with incineration and landfill and Permeable reactive barrier (PRB) technology has emerged as an efficient, cost-effective and sustainable remediation technique for the variety of contaminants.

- Solution to various environmental and health hazards
- Making the soil free from leachate effect.
- Conversion of waste sites into eco-friendly area
- Economic solution to the contamination effect
- Solution to disposal of polythene waste into soil

MATERIALS AND METHODOLOGY

Two soil samples were collected from fields.Soil in which polythene waste and pgram bacteria to be mixed were collected from chiyyaram which is an inorganic type soil and clayey soil which to be mixed with zero valent iron in order to act as low permeable reactive barrier were collected from marathakkara.The 0.05mm diameter zero valent iron powder is utilised as reactive media in low permeable reactive barrier.Polythene waste of 40 microns were considered in this study. P gram negative bacterial strain collected from kerala agricultural university ,Mannuthy.The experimental study were conducted in two forms of polythene waste.One is in form of plastic strip and other in form of microplastic.0.3% addition of polythene gives soil its most stable condition.Two samples are prepared : (A) soil mixed with 0.3%polythene strip and 1% p gram bacteria .(B) soil mixed with 0.3% microplastic and 1% p gram bacteria.

Fig 1:polythene strip

Figure 1 and 2 clearly shows size of polythene waste used for sample preparation.Polythene strip is in size of 3cm length and 1cm width.Microplastic form of polythene is the other sample.

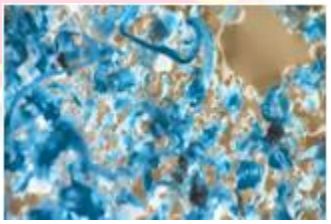

Fig 2:Polythene in microplastic form

Figure 3 shows the polythene mixed with soil sample .Compaction characteristics of these soil samples were analysed after 7 and 14 days.On calculating the results the best form of polythene which can be disposed into soil is obtained.

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Fig 3:Polythene waste mixed soil

Column tests on these best sample is conducted by incorporating reactive media,is used to determine the rate of flow and quality of leachate generating from the soil sample.Column tests were conducted in a cylindrical column having 40 cm diameter and 5 cm height.0.4 % addition of zero valent iron in clayey soil can act as an effective reactive medium.Column test arranagement is done by adding reactive media in bottom upto a height of 10cm and above reactive media soil sample is placed upto a height of 26cm. Top 2cm and bottom 2cm of column is filled with sand for better performance of experiment.

V.RESULTS AND DISCUSSION

The tests for index properties and engineering properties of two soil samples were determined by conducting series of laboratory experiments.Table 1 and 2 clearly shows the basic properties of soil collected from various fileds.From the results it is concluded that chiyyaram soil a inorganic type soil and marathakkara soil shows the properties of clayey soil.

Table 1 :Basic properties of inorganic soil

SOIL PROPERTIES	VALUES
Uniformity coefficient, c_u	6.086
Coefficient of curvature, c_c	1.428
Specific gravity,g	2.540
Liquid limit (%)	23.9
Plastic limit (%)	15.63
Flow index(%)	22.5
Plasticity index(%)	8.27
Optimum moisture content (%)	11.68
Maximum dry density(g/cc)	1.93
Permeability(Cm/s)	$8.057X10^{-4}$
Unconfined compressive strength (KN/m^2)	78

Figure 4 shows compaction characteristics of soil with various percentage of p gram bacteria.On adding 1% it shows better strength.Further addition makes the soil to loose its strength.For preparing the samples standard proctor test is conducted by adding various percentages of polythene strip with 1% of p gram bacteria.0.3% addition of polythene strip shows better result.Similarly 0.3% addition of microplastic made the soil more stabilized.Figure 5 shows the dry density variation on adding various percentage of polythene strip and microplastic into soil along with p gram negative bacteria.Based on the results samples are prepared.First sample is sample (A):1%p gram negative bacteria and 0.3% polythene in strip formand sample (B):1% p gram negative bacteria and 0.3% microplastic form of polythene.Compaction characteristics of two soil samples that is (A) soil mixed with 0.3%plastic strip and 1% p gram bacteria (B) soil mixed with 0.3% microplastic and 1% p gram bacteria shows an incremental value in its strength characteristics.On comparing the dry densities of both samples ,the sample (A) shows more strength.Figure 6 shows changes in dry densities of sampla(A) and sample (B) after 7 and 14 days.Sample (A) after placed in aerobic condition for 7 days its dry density changed from 1.931 g/cc to 1.935 g/cc.Again after 14 days its dry density reaches to1.94g/cc

Table 2:Basic properties of clayey soil

SOIL PROPERTIES	VALUES
Uniformity coefficient, c_u	11.42
Coefficient of curvature, c_c	3
Specific gravity,g	2.1
Liquid limit (%)	48.1
Plastic limit (%)	25
Flow index(%)	27.5
Plasticity index(%)	23.1
Optimum moisture content (%)	21.55
Maximum dry density(g/cc)	1.62
Permeability(Cm/s)	$2.518X10^{-4}$
Unconfined compressive strength (KN/m^2)	67

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Dry density of sample (B) at zero curing shows a value 0f 1.916 g/cc.Sample (B) after placed in aerobic condition for 7 days its dry density changed from 1.92 g/cc to 1.932 g/cc.Again after 14 days its dry density reaches to1.932g/cc. In case of sample (B) there is also an increment in dry densities but when comparing with sample (A) it is less.

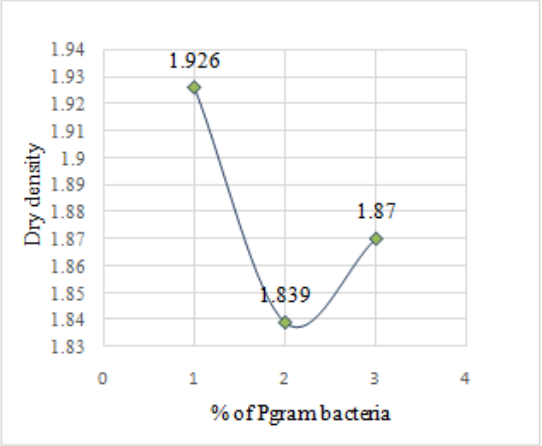

Figure 4:Dry densities on addition of various percentage of p gram bacteria into soil

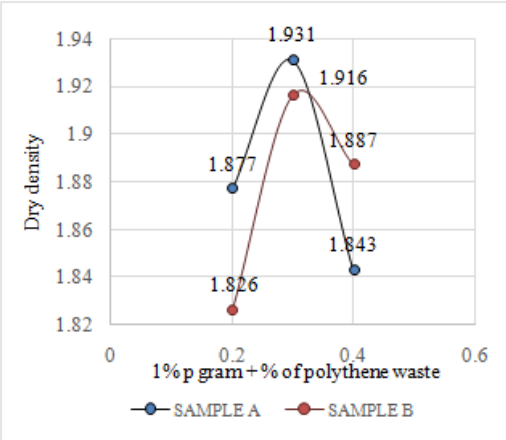

Figure 5:Dry density of samples with 1% pgram bacteria with various % of polythene waste

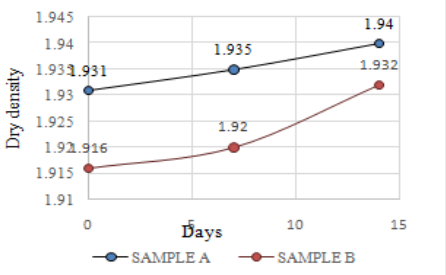

Figure 6:Compaction values after 7 and 14 days

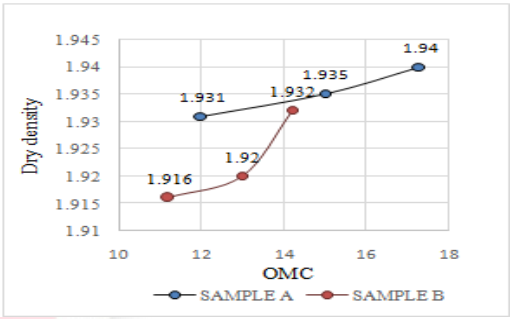

Figure 7:Dry density Vs OMC

From standard proctor test conducted after 7 and 14 days along with dry density OMC is also increasing.Figure 7 shows increment rate of both samples (A) and (B) after 7 and 14 days. By comparing dry density values sample (A) is the best in comparing with sample (B).Column test is conducted for sample (A) by placing low permeable reactive barrier and without placing low permeable reactive barrier.Figure 8 shows the variation in pH after conducting column studies.

Table 3: Environmental test results

Days	Without reactive barrier		With reactive barrier	
	pH	TDS(mg/L)	pH	TDS(mg/L)
7	8.4	550	8	468
14	8.74	789	7.51	344

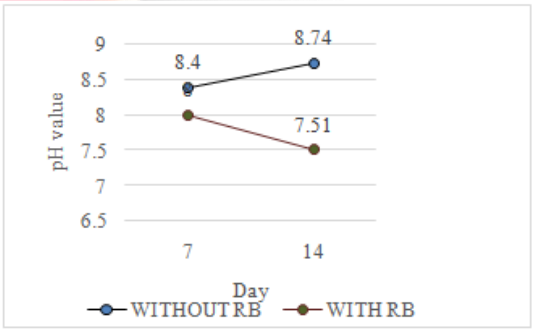

Figure 8:pH variation

Table 3 shows environmental tests results of sample (A).TDS counts variations shows that placement of reactive media is having a big role in effluent quality.After placing reactive

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media there was a decrease in TDS value.In case of pHalkalinity level is decreasing from seventh day onwards which makes it suitable for environment.ZVI particles were successfully loaded onto clayey , and the resulting ZVI was thoroughly characterized using column test. The mechanism of ZVI with clay may involve adsorption coupled with the other chemical reaction. Moreover, ZVI with clay exhibited a better reaction comparable with those of other catalysts/adsorbents.

CONCLUSIONS

0.3% of polythene strip and 1% pgram negative bacteria (sample A) shows better results in compaction characteristics. Difference in surface areas of polythene in strip form and microplastic is the reason for this variation.By conducting the column studies for sample (A) it is proved that the Nanoparticles such as zero valent iron help in soil remediations. They can a be anchored onto a solid matrix such as clay for enhanced treatment of effluent.On combining p gram bacteria together with a low permeable reactive barrier in soil helps in safe disposal of waste hence reducing environmental and other health hazards.

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Credit Card Fraud Detection Using Machine Learning

Anu Baby[1], Sanjukrishna V S[2], Rohit G Nair[3], Seshma M S[4], Aiswarya Mohan[5]
[1,2,3,4]PG Student, Department of Computer Science and Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala
[5]Assistant Professor, Department of Computer Science and Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala

Abstract*—Credit cards are simple and amicable targets. Internet business and numerous other online locales have expanded the utilization of online installment modes, expanding the danger for online cheats. With the increment in fraud rates, analysts began utilizing diverse AI techniques to identify and dissect cheats in online transactions. The fundamental point of the paper is to plan and foster a novel misrepresentation identification strategy for Streaming Transaction Data, with a goal, to break down the past transaction subtleties of the clients and concentrate the standards of conduct. Where cardholders are bunched into various gatherings dependent on their transaction sum. The utilizing a sliding window technique, to total the transaction made by the cardholders from various gatherings with the goal that the personal conduct standard of the gatherings can be removed individually. Later various classifiers are prepared over the gatherings independently. And afterward the classifier with better appraising score can be picked to be probably the best technique to foresee fakes. In this manner, trailed by a criticism instrument to take care of the issue of idea float. In this paper, we worked with European charge card fraud dataset.

***Index Terms*—Machine Learning, Logistic Regression, SMOTE, PCA, Random Forest.**

INTRODUCTION

With no dangers, a critical sum can be removed without the proprietor's information, in a brief Credit cards for the most part alludes to a card that is doled out to the client (Cardholder), generally permitting them to buy labor and, Products inside credit or pullout cash ahead of time. Credit cards give the cardholder a benefit of the time, i.e., it Gives time to their clients to reimburse later in a recommended time, Via conveying it to the following charging cycle. Credit card fakes are obvious objectives period. Fraudsters consistently attempt to make each false transaction genuine, which makes fraud detection extremely difficult. In 2017, there were 1,579 information breaks and almost 179 million records among which Credit card cheats were the most widely recognized structure with 133,015 reports, at that point business or assessment related fakes with 82,051 reports, and telephone fakes with 55,045reports followed by bank fakes with 50,517 reports from the statistics.

II.RELATED WORKS

Different Supervised and Semi-Supervised machine learning strategies are utilized for misrepresentation discovery, yet we point to conquer three fundamental difficulties with card cheats related dataset i.e., solid class unevenness, the incorporation of marked and unlabeled examples, and to expand the capacity to handle countless transactions. Distinctive Supervised AI calculations like Decision Trees, Naive Bayes Classification, Least Squares Regression, Logistic Regression and SVM are utilized to recognize deceitful transactions in progressive datasets. Two techniques under random forests are utilized to prepare the conduct highlights of typical and unusual transactions. They are Random-tree-based random forest and CART-based. Despite the fact that random forest acquires great outcomes on little set information, there are still a few issues in the event of imbalanced information. The future work will zero in on tackling the previously mentioned issue. The calculation of the random forest itself ought to be improved. Performance of Logistic Regression, K-Nearest Neighbor, and Naïve Bayes are dissected on profoundly slanted Credit card fraud information where Research is done on looking at meta-

classifiers and meta-learning approaches in dealing with exceptionally imbalanced Credit card misrepresentation information. Through supervised learning strategies can be utilized there may fall flat at specific instances of recognizing the misrepresentation cases. A model of deep Auto-encoder and confined Boltzmann machine (RBM) that can build typical transactions to discover oddities from ordinary examples. Credit hazard is the danger of monetary misfortune when a borrower neglects to meet the monetary responsibility. While there are numerous components that establish credit hazard, due tirelessness while giving advance (credit scoring), ceaseless observing of client installments and other personal conduct standards could lessen the likelihood of amassing non-performing resources (NPA) and frauds. In the previous few years, the quantum of NPAs and fakes have gone up fundamentally, and accordingly it has become basic that banks and monetary establishments utilize vigorous systems to anticipate the exhibition of advances. The previous twenty years has seen a gigantic development in the space of man-made consciousness, most quite AI (ML) with improved admittance to web, information, and process. While there are FICO assessment offices and credit scoring organizations that give their investigation of a client to banks on a charge, the specialists keep on investigating different ML methods to improve the exactness level of credit hazard assessment. In this study paper, we played out an orderly literature survey on existing examination strategies and ML methods for credit risk assessment. We investigated an aggregate of 136 papers using a credit card hazard assessment distributed among 1993 and March 2019. We considered the ramifications of hyper boundaries on M procedures being utilized to assess credit hazard and dissected the restrictions of the flow studies and examination patterns. We saw that Ensemble and Hybrid models with neural networks and SVM are in effect more embraced for credit scoring, NPA forecast and misrepresentation identification. We likewise understood that absence of complete public datasets keep on being a space of worry for specialists. For recognizing Credit card hazard in huge and high dimensionality information, highlight choice is considered vital to improve order execution and fraud distinguishing proof cycle. One of the generally utilized component determination strategies is Random Forest Classifier (RFC), which is entirely appropriate for enormous dataset. RFC has a decent presentation; it will in general distinguish the most prescient highlights, which may give a critical improvement in arrangement execution of Credit card hazard recognizable proof model. In this paper, we propose an upgraded Credit Card Risk Identification (CCRI) technique dependent on the highlights choice calculation as Random Forest Classifier and Support Vector Machine to recognize misrepresentation hazard. Our exploratory outcomes show that the proposed calculation beats the Local Outlier Factor, Isolation Forest and Decision Tree as far as grouping execution on a bigger dataset. These days individuals like to utilize web based business due to effortlessness, timesaving, comfort, and so forth by the expansion in online business use, Credit card fraud increments. The fraudsters get the advantage of online installments and taking the card subtleties. Hence, it is fundamental to improve the location techniques to beat the fraudster's action and secure the card transactions. The motivation behind this examination is to research the exhibition of a few individual various classifiers and the mix of classifiers utilizing troupe techniques for charge card misrepresentation location. The investigation is coordinated as at first the three notable classifiers i.e., Decision Tree, Naïve Bayes and SVM have been applied. A short time later the gathering learning module has been applied utilizing the boosting strategy with the recently referenced grouping calculations. The dataset utilized is an open-source Visa transaction dataset containing 3075 transactions. The performance of the classification procedures is assessed based on accuracy, sensitivity, specificity, precision, ROC value and F -measure. The result shows that Boosting with Decision Tree outperforms the other techniques. With the development of web based shopping, Credit Card Fraud (CCF) comes out as a genuine threat. For this end, the programmed and constant *fraud* recognition field requires a few examinations. The new ones utilize many Machine Learning (ML) strategies and methods because of their advantageous attributes to construct a decent fitting model to get false *transaction*s. The reason for this paper into fosters another model dependent on a half breed approach for Credit Card Fraud Detection (CCFD). The

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proposed model, contrasted with past examinations, shows its solid capacity to recognize *fraud transaction*. Absolutely, the power of our model is developed by consolidating the fortitude of three sub-strategies; the Recursive Feature Elimination (RFE) for choosing the most valuable prescient highlights, the GridSearchCV for Hyper-Parameters Optimization (HPO) and the Synthetic Minority Oversampling (SMOTE) to conquer the imbalanced information issue. The experimentations of our model, on some certifiable informational collections, give the best outcomes as far as proficiency and adequacy are considered.

PROPOSED SYSTEM

Card transactions are consistently new when contrasted with past transactions made by the client. This newness is an exceptionally troublesome issue in true when are called concept drift problems. Concept drift can be said as a variable which changes after some time and unforeseen. These factors cause a high imbalance in data. The fundamental point of our exploration is to conquer the issue of Concept float to execute on certifiable situation.Thedataset contains transactions made by a cardholder in a term in 2 days i.e., two days in the period of September 2013. Where there are an all-out 284,807 transactions among which there are 492 i.e., 0.172% transactions are deceitful transactions. This dataset is exceptionally lopsided. Since giving transaction subtleties of a client is viewed as an issue identified with privacy, in this way the greater part of the highlights in the dataset is changed utilizing head segment investigation (PCA). V1, V2, V3,..., V28 are PCA applied highlights and rest i.e., 'time', 'sum' and 'class' are non-PCA applied highlights. Principal Component Analysis, or PCA, is dimensionality-decrease strategy that is frequently used to lessen the dimensionality of enormous informational collections, by changing a huge arrangement of factors into a more modest one that actually contains the vast majority of the data in the huge set .Reducing the quantity of factors of an informational index normally comes to the detriment of exactness, however the stunt in dimensionality decrease is to transaction a little precision for effortlessness. Since more modest informational indexes are simpler to investigate and envision and make dissecting information a lot simpler and quicker for AI calculations without unessential factors to measure. SMOTE represents Synthetic Minority Oversampling Technique. This is a factual method for expanding the number of cases in the dataset in a balanced way. The module works by generating new instances from existing minority cases that you supply as input.Afterthis technique we should get a balanced dataset. Random Forest is a supervised learning algorithm we use in our work. For classification regression and different tasks work by developing a huge number of decision trees at a preparation time. This Random Forest forms numerous decision trees and combines them to get a more precise and stable prediction. For applications in classification problems, random forest algorithm will stay away from the over fitting issue. We accept that the client knows about the development of single classification trees. Random Forests develops numerous classification trees. To classify another object from an information vector, put the info vector down every one of the trees in the forest. Each tree gives a classification, and we say the tree "votes" for that class. The forest picks the classification having the most votes (over all other trees).

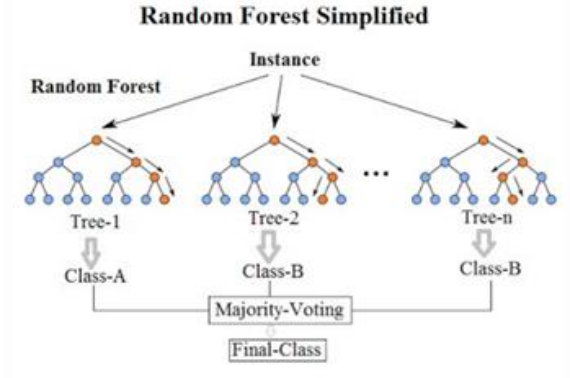

Fig 1. Random Forest Simplified

Logistic regression classifier is utilized in our project. It is statistical techniques for examining our dataset in which there are at least one independentvariablesthat decides a result. The result is estimated with a dichotomous variable, where there are just two potential results i.e., fraud or genuine. The objective of logistic regression is to track down the best fitting model to depict the connection between the dichotomous quality of interest, and a bunch of independent factors. Logistic Regression creates the coefficient of an equation to foresee a rationale change of the likelihood of quality of

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normal for interest.

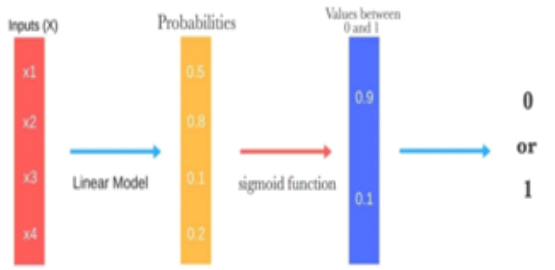

Fig 2. Logistic Regression Classifier

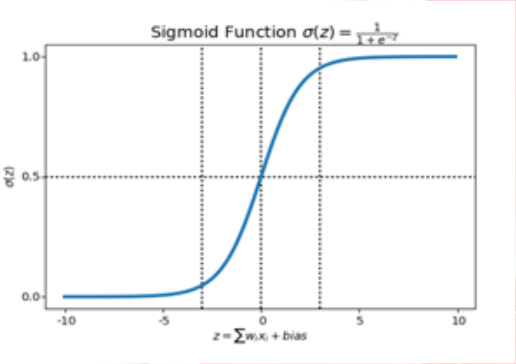

Fig 3. Sigmoid Curve

EXPERIMENTAL RESULTS

Technology used for experimentation:

HTML: Page layout has been designed in HTML

CSS: CSS has been used for all the designing part

JavaScript: All the validation task and animations has-been developed by JavaScript

Python: All the business logic has been implemented in Python

MySQL:MySQL database has been used as database for the project

Django: Project has been developed over the Django Framework

Machine learning system is trained using real time data sourced from ULB machine learning group. The dataset contains 2.87 lakh transactions. We were able to consistently produce outputs with accuracy levels to the tune of 99% or higher. The following figures demonstrate the scope and performance of our project.

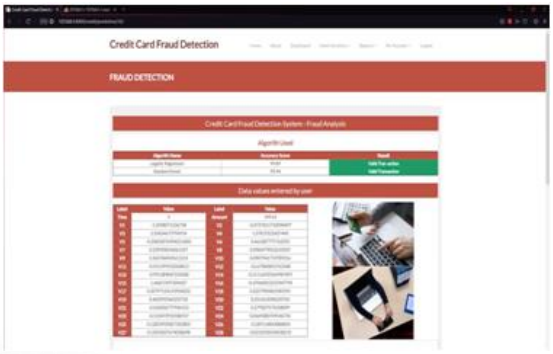

Fig 4. Output for test data with a single tuple

Fig 5. Output for test data with multiple tuples

CONCLUSION

In this venture we execute a novel technique for fraud recognition, where clients are grouped dependent on their transaction and concentrate standards of conduct to foster a profile for each cardholder. At that point various classifiers are applied on three distinct groups later appraising scores are created for each kind of classifier. These unique changes in boundaries lead the framework to adjust to new cardholder's transaction practices conveniently. Followed by an input instrument to tackle the issue of concept drift. We saw that the Matthews Correlation Coefficient was the better boundary to manage imbalance dataset. MCC was by all account not the only arrangement. By applying the SMOTE, we took a stab at adjusting the dataset, where we tracked down that the classifiers were performing better than expectation. The alternate method of taking care of imbalance dataset is to utilize one-class classifiers like one-class SVM. We at last saw that Logistic regression and random forest are the algorithms that gave better outcomes.

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In the course of the most recent few decades, quantum computing has been a 1-D research effort zeroing in on seeing how to make reasonable quits and how to execute the distinctive universal quantum gate sets on any of the numerous quantum approaches. To the extent PC architectural decisions were made, the community has been cantered especially around the von Neumann architecture and characterized quits as far as memory and preparing qubits.

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ANALYSIS AND CONTROL OF SETTLEMENT IN BURIED PIPES

RANJIMA K S[1], ANJU E M[2], RENJINI R[3], HASNATHSHARRAJ[4]
[1,2,3]PG Student, Department of Civil Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala, India
[4]Assistant Professor, Department of Civil Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala, India

Abstract- ***Pipelines are most important mode of transporting liquids like petroleum, petroleum products, natural gas, water, milk, etc. Solids can also be transported through pipelines after converting them into slurry. Buried pipelines are mainly used for water supply system and drainage besides many applications in your country. Due to application of repeated load or heavy static load from temporary structures pipes gets deformed or damaged. This damage includes buckling or cracking which causes leakage of liquids. This will ultimately lead to high economical loss, public hindrance and hazards. So it is very necessary to analyze the possible settlement that can occur in a pipeline. Hence we consider a case in which a shallow footing is placed over buried flexible pipe. The location of the pipe below the footing is an important parameter. Main objective of our study is to determine the effect of depth on load settlement response of footing by plate load test, to determine the improvement in the load carrying capacity of footing by using geotextile reinforcement, to determine the strain on pipe on different depth and diameter of pipe using strain gauge. The main parameter of the study is the depth of buried pipe. Plate load tests are conducted in a rectangular box of size 500x500x500mm after placing a model footing on the surface of the soil. Footing of size 100x100mm with thickness of 10mm is used to apply the load on soil. The buried flexible pipe placed at different depths to know the effect of depth of pipe on the behavior of footing.***

Keywords: Settlement, Geotextiles, Strain

INTRODUCTION

Now a day's human population is growing at startling rates. This growth also gets reflected in various demands put forth by them. There is also significant growth in land use for various construction activities. Development of a country requires lot of facilities like well planned cities, transportation facilities, hospitals, industries, ports and harbors, power plants, dams etc. These facilities in turn demand for water, gas, oil and several chemicals for their functioning. These materials may be so far located from the site of requirements. Transportation of such materials from and to the sources requires pipelines. All these structures require large number of pipelines and land for their installation. When these pipelines are constructed over land it will possess shortage in land for other purposes and may intervene the traffic. To avoid this condition pipelines are constructed below the ground. Providing pipelines underground avoids the risk of contact with surroundings, public intervenes. Pipelines are safest and convinentmode of transporting liquids like petroleum, petroleum products, natural gas, water, milk, etc. Solids can also be transported through pipelines after converting them into slurry or changing in to liquid in our country. The country Indianhead a network of about 5,035 km long pipes which has increased to over 7,000 km now. Their installation posses high economic profile and since laid underground, geotechnical aspects of surrounding soil should be investigated. Site investigation is conducted to gain geotechnical, geological and other relevant information about the subsoil of the area where construction will take place.

Fig.1.1 Schematic diagram of building construction over a buried pipe

OBJECTIVE

The study deals with the behavior of footing over the pipe having different depth with or without geotextile reinforcement. Plate load tests are conducted to determine the load – settlement response of footing at different tests condition. To determine the effect of depth of pipe on the load settlement response of footing by plate load test and the improvement in the load carrying capacity of footing over varied pipe using geotextile reinforcement.

MATERIALS AND METHODOLOGY

Bed material used was collected from natural source available locally. For this particular study late rite was used as bed material, and was collected from Adatt, near Thrissur. Late rite soil was preferred since it is quite abundant in Kerala. Laterite was completely dried in open atmosphere prior to testing.PVC pipe of 40mm diameter and 2mm thickness was used in experimental study. The length of pipe was 60cm so as to protrude out of the tank. It is used to model buried flexible pipe Loading tests were carried out on a square footing fabricated from mild steel. The model was having width of 100mm and thickness of 10mm. Geotextiles are planar, permeable, polymeric (synthetic or natural) textile materials, which may be nonwoven, knitted or woven, used in contact with soil/rock and/or any other geotechnical material in civil engineering applications including roads, airfields, dams, bank protection etc. They are used in association with soil to separate, filter, reinforce, drain protection.Geotextile is a part of technical textile which is used for special purposes. Geotextiles form one of the two largest groups of Geo synthetics. The raw material of geotextile comes from polyester, Polyamide, Polypropylene and Polyethylene. The application of geotextile is civil engineering, coastal engineering and also hugly used in the area of construction site. Generally, geotextiles are located in the tension area to make stronger the soil. The inner dimensions of test tank were 500x500x500mm length, width and depth respectively. The dimensions of the tank were fixed by considering the dimensions of footing, and their influence zone. Strain on the pipe was measured with strain gauge. Strain gauges were purchased from Aron instruments, Chennai. Strain gauge of length 6mm with resistance 350 Ohms was used. The proving ring and the dial gauges are set to zero before the testing was started. The test was started by applying load using hand operated hydraulic jack. The settlement of footing as indicated by the dial gauge and corresponding change in voltage by multimeter was noted. The footing was loaded at a constant loading rate until an ultimate bearing state was reached. The behavior of footing was obtained by plotting the graph between normalized settlements corresponding to applied pressure

RESULTS AND DISCUSSIONS

Specific gravity

Laboratory tests were carried out as per the Indian standard codes for determining specific gravity IS : 2720:1980. The specific gravity of sample is 2.56 using pycnometer. The value of specific gravity should be between 2 to 2.9 and the obtained value is within the limit.

Grain size analysis

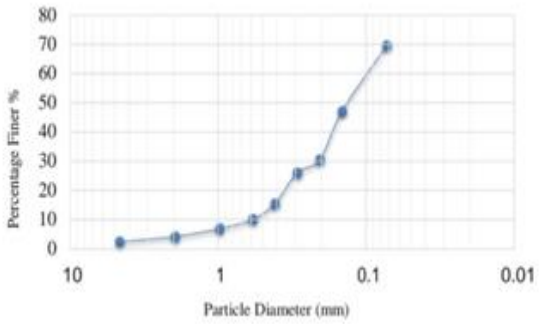

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Fig 4.1 particle size distribution curve

Figure 4.1 shows the particle size distribution curve of late rite. By plotting the curve, various percentages of particles present in given sample can be determined. The sand content, silt content and clay content in given sample of late rite were 8%, 24%, 68% respectively. By observing the graph, curve is located on the left end. So most of the soil consists of fine grained soil, which is clay.

Atterberg's limits

The water content at which the soil changes from one state to the other are known as Atterberg, s limits. It includes liquid limit, plastic limit, and shrinkage limit and these are considered as the most important index properties of fine grained soils. A plot was made between the water content as ordinate and the number of blows on log scale as abscissa. The plot is approximately a straight line. This plot is known as flow curve. The liquid limit is obtained, from the plot, corresponding to 25 blows. Here the soil has a liquid limit of 52%. The plastic limit and shrinkage limit of the soil were 19.9 and 12 respectively.

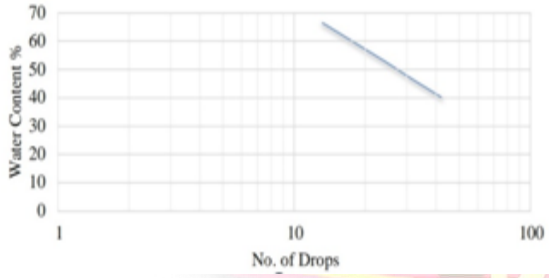

Fig 4.2 flow curve

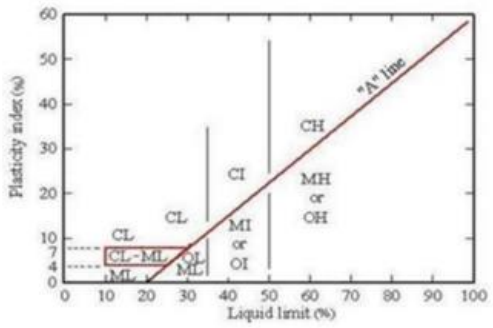

Fig 4.3 Plasticity chart

Table 4.1atterberg limit values

PROPERTIES	VALUES
Liquid limit (%)	52
Plastic limit (%)	19.9
Shrinkage limit (%)	12
Plasticity index (%)	32.1
IS classsification	CH

Compaction test

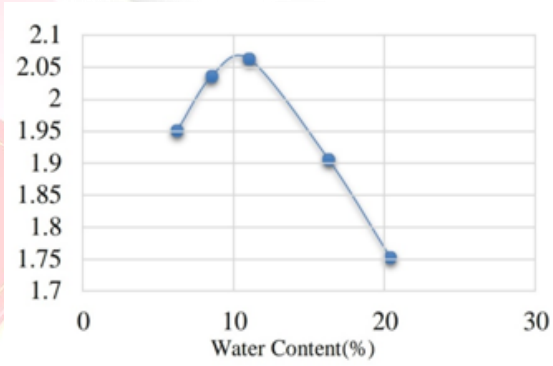

Fig 4.4 compaction curve

Maximum dry density and optimum moisture content of the given sample is determined by plotting the compaction curve and is 2.062 g/cc and 10(%) respectively.

Unconfined compression test

From UCC test, the value of unconfined compressive strength of the given sample obtained was 137.58 KN/m2. The untrained shear strength of clay is 68.69 KN/m2. The results obtained from the compaction test and unconfined compression test are tabulated in Table.

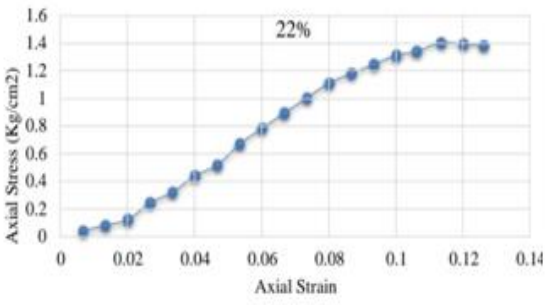

Fig 4.5 stress strain behaviour of soil

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Table 4.2 Results of UCC tests

PROPERTIES	VALUES
OMC (%)	10
Unconfined compressive strength (kN/m^2)	137.58
Undrained shear strength(kN/m^2)	68.69

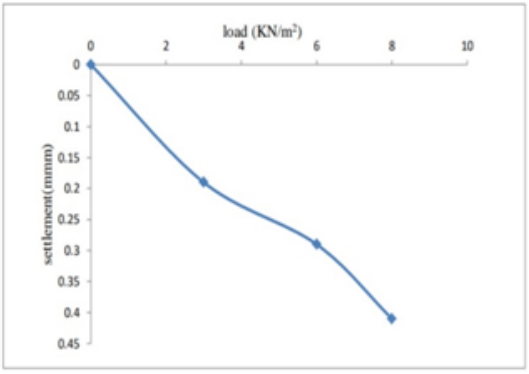

Fig.4.8 load settlement response of pipe at 20 cm depth

EFFECT OF DEPTH OF PIPE ON THE BEHAVIOR OF FOOTING

Plate load test was conducted to determine the effect of depth on the behavior of footing. Here plate load test was conducted to determine the load – settlement response of 40 mm pipe

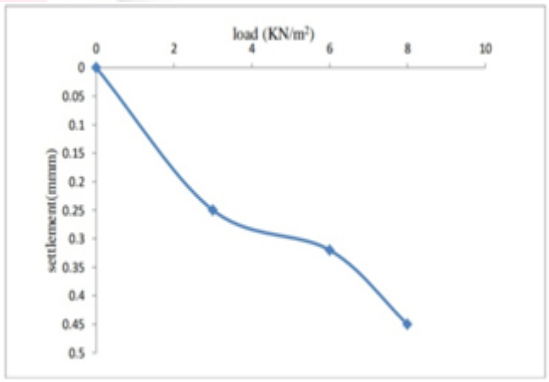

Fig.4.9 load settlement response of pipe at 10 cm depth

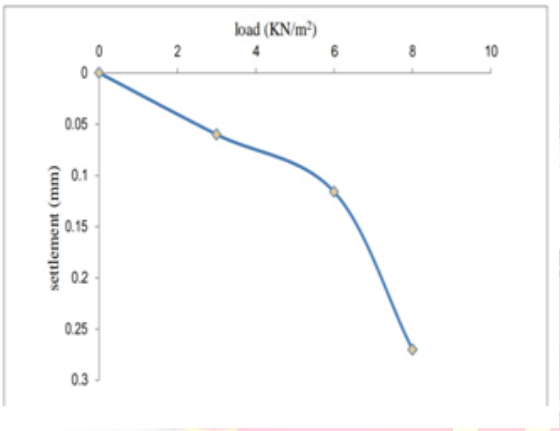

Fig.4.6 load-settlement response of pipe 40 cm depth

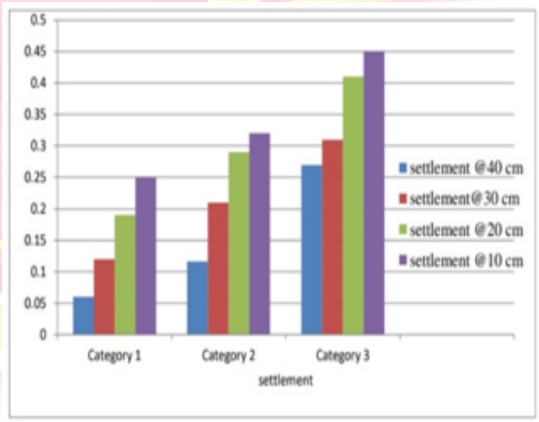

Fig.4.10.comparison of effect of settlement at various depths

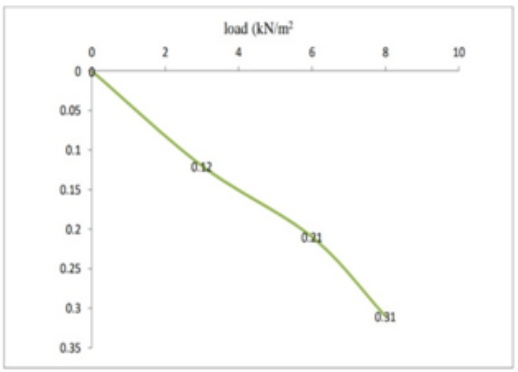

Fig.4.7 load settlement response of pipe at 30 cm depth

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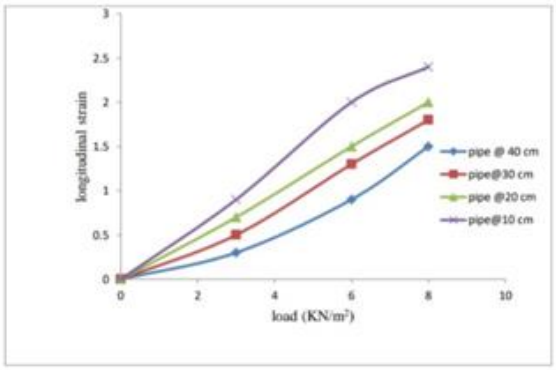

Fig.4.11 Longitudinal strain vs. load response of footing at different depth

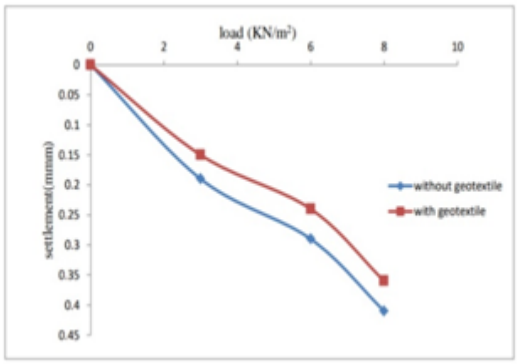

Fig.4.12 Effect of 40 mm dia pipe on behavior of footing at 20 cm depth with geotextile

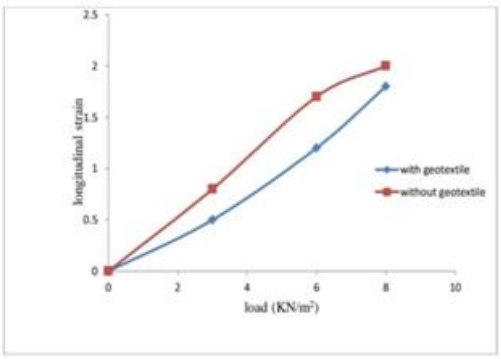

Fig.4.13 effect of strain 40 mm dia pipes on behavior of footing with geotextile

CONCLUSIONS

Plate load tests are conducted on a model footing on soil over buried pipe placed at various depths. Different plate load tests are done to determine the effect of depth of pipe on the behavior of footing. Pipe has significant effects on load settlement response of footing, when pipe existed in the failure zone of footing. Depth of pipe is the important parameter which decides the critical region of footing. Load carrying capacity of footing over pipe increases with increase in the depth of footing. Failure zone of 40 mm diameter pipe is the 2B. Load carrying capacity of footing is highly influenced by the pipe placed at 1.5B and load carrying capacity of footing increased with increase in depth of pipe from the base of footing. Geotextile reinforcements are used to reduce the effect of pipe on the behavior of footing in the failure zone of footing. Geotextile reinforcements are very effective to improve the load carrying capacity of footing. 40 mm diameter pipe placed at 2B depth with a layer of geotextile reinforcement shows the 1.81 times improvement in load carrying capacity of footing than unreinforced condition. In failure zone, the undesirable effect of pipe is reduced by providing optimum number of geotextile layers between base of footing and pipe.

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REMEDIATION OF HEAVY METAL CONTAMINATED SOIL USING BIOCHAR AND EDTA

Akhila Asokan[1], Oshin Ann Mathews[2]
[1]PG Student, Department of Civil Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala
[2]Assistant Professor, Department of Civil Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala

Abstract – Heavy metal contamination is increasing day by day. Cultivation in this soil causes toxic effects on the environment. Remediation is one of the most important techniques to remove all these trace elements. This heavy metal gets accumulated in the soil and is absorbed by plants. Dosage level of synthetic pesticides is higher and is one of the main reasons for accumulation of heavy metals.

Anthropogenic activities such as mining, smelting, chemical production, energy production, manufacturing of metals and factory emissions dispose large amounts of Cd and Pb into soil, and cause widespread soil contamination. The study was conducted to understand the feasibility of remediation of heavy metals (HM) from contaminated soil using biochar and Ethylene Diamine Tetra Acetic acid (EDTA) solution. The biochar used for the study are environment-friendly extract ants, which are less expensive. The soil samples were prepared by introducing the heavy metals artificially into the late rite soil. Water soluble salts of lead and cadmium were used to make the soil contaminated. The sample was then mixed with biochar and EDTA solutions in separate bags and kept for 24 days. At the end of the study, it was recorded that the concentrations of HMs in the soil samples mixed with biochar and EDTA has reduced drastically compared with other two mixes.

Keywords- Biochar, EDTA

INTRODUCTION

Cd and Pb contamination of soil throughout the world has become a priority environmental concern. As typical heavy metals, Cr and Pb are identified as priority pollutants by the US Environmental Protection Agency. Anthropogenic activities such as mining, smelting, land application of fertilizers, Chemical and metal production and factory emissions dispose large amounts of Cd and Pb into soil, and cause widespread pollution. Heavy metals constitute an ill-defined group of inorganic chemical hazards and those most commonly found at contaminated sites are lead (Pb), chromium (Cr), arsenic (As), Zinc (Zn), Cadmium (Cd), copper (Cu), mercury (Hg), and nickel (Ni). Soils are the major sink for heavy metals released into the environment by aforementioned anthropogenic activities and unlike organic contaminants which are oxidized to carbon oxide by microbial action, most metals do not undergo microbial or chemical degradation, and their total concentration in soils persists for a long time after their introduction Changes in their chemical forms (speciation) and bioavailability are, however, possible. The presence of toxic metals in soil can severely inhibit the biodegradation of organic contaminants. Heavy metal contamination of soil may pose risks and hazards to humans and the ecosystem through: direct ingestion or contact with contaminated soil, the food chain (soil-plant-human or soil-plant-animal-human), drinking of contaminated groundwater, reduction in food quality (safety and marketability) via phytotoxicity, reduction in land usability for agricultural production causing food insecurity, and land tenure problems. The adequate protection and restoration of soil ecosystems contaminated by heavy metals require their characterization and remediation. Contemporary legislation respecting environmental protection and public health, at both national and international levels, are based on data that characterize chemical properties of environmental phenomena, especially those that reside in our food chain. While soil characterization would provide an insight into heavy metal speciation and bioavailability, attempt at remediation of heavy

metal contaminated soils would entail knowledge of the source of contamination, basic chemistry, and environmental and associated health effects (risks) of these heavy metals. Risk assessment is an effective scientific tool which enables decision makers to manage sites so contaminated in a cost-effective manner while preserving public and ecosystem health.

Sources of Heavy Metals in Contaminated Soils

Heavy metals occur naturally in the soil environment from the pedogenetic processes of weathering of parent materials at levels that are regarded as trace (<1000 mg kg−1) and rarely toxic. Due to the disturbance and acceleration of nature's slowly occurring geochemical cycle of metals by man, most soils of rural and urban environments may accumulate one or more of the heavy metals above defined background values high enough to cause risks to human health, plants, animals, ecosystems, or other media. The heavy metals essentially become contaminants in the soil environments because (i) their rates of generation via man-made cycles are more rapid relative to natural ones, (ii) they become transferred from mines to random environmental locations where higher potentials of direct exposure occur, (iii) the concentrations of the metals in discarded products are relatively high compared to those in the receiving environment, and (iv) the chemical form (species) in which a metal is found in the receiving environmental system may render it more bio available. Metal-bearing solids at contaminated sites can originate from a wide variety of anthropogenic sources in the form of metal mine tailings, disposal of high metal wastes in improperly protected landfills, leaded gasoline and lead-based paints, land application of fertilizer, animal manures, bios lids (sewage sludge), compost, pesticides, coal combustion residues, petrochemicals, and atmospheric deposition.

OBJECTIVES

To use biochar and EDTA to remediate Cd and Pb contaminated soil.. To determine the combination (edta alone, biochar alone, edta+biochar) which is more effective in remediation?

MATERIALS AND METHODOLOGY

BIOCHAR

Biochar is pyrogenic black carbon derived from thermal degradation (e.g., pyrolysis) of carbon-rich biomass in an oxygen-limited environment. In recent years, biochar has received increasing attention due to its multi-functionality including carbon sequestration and soil fertility enhancement, bio-energy production, and environmental remediation. Rice straw was collected, air-dried and cut to lengths less than 2 cm. Rice straw biochar (RB) was produced by slowly pyrolysis under N2 in a muffle furnace Then biochar samples were collected and crushed.

EDTA

Ethylene dia minetetraacetic acid (EDTA) is an amino polycarboxylic acid with the formula [CH2N(CH2CO2H)2]2. This white, water-soluble solid is widely used to bind to iron and calcium ions. It binds these ions as a hex dentate ("six-toothed") chelating agent. EDTA is produced as several salts, notably disodium EDTA, sodium calcium edentate, and tetra sodium EDTA

LATERITE SOIL

The soil used for the study was collected from the college campus and air dried before commencement of experiments.

The collected soil is transported to laboratory and airs dried to remove the moisture content. Then preliminary tests are conducted the tests conducted to find the basic properties of soil are as follows:

Specific gravity test Dry sieve analysis Atterberg limits and indices Compaction test unconfined compression test (UCC)

Water soluble salts of Lead and Cadmium salts are added into the air dried soil to make the soil contaminated. The percentage of contamination was two. Artificially contaminated soil is then kept for a period of 24 days. After 24 days the bichar made from rice straw and EDTA are introduced into the contaminated soil and kept for next 24 days for remediation.

RESULTS AND DISCUSSIONS

The basic properties of laterite soil determined and tabulated in table 1

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Table 1 Basic Properties of Late rite Soil

Properties	Value
Specific gravity	2.77
Uniformity coefficient	11.43
Coefficient of curvature	1.06
Liquid limit	42%
Plastic limit	18%
Shrinkage limit	12%
Plasticity index	16
Soil type	MI
Optimum moisture content	14.78%
Maximum dry density	1.84
Unconfined compressive strength	353.16KN/m^2

Figure 1 shows the effect of EDTA, rice straw biochar and EDTA & biochar combination on artificially heavy metal contaminated soil.

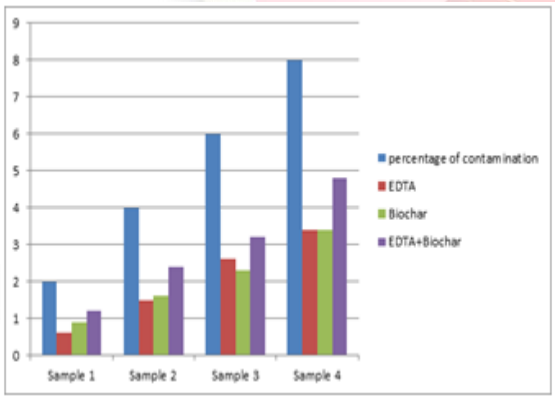

Figure 1: Effect of biochar and EDTA on contaminated soil

60 % of the heavy metal concentration is removed by the addition of biochar and EDTA together which is more effective in removing the heavy metal concentration from the soil. Whereas the addition of biochar alone or EDTA alone removed less amount of heavy metal from the soil.

CONCLUSIONS

In short, we can say that the heavy metals lead and cadmium can be removed using biochar and EDTA which are less expensive and highly available. The combination of EDTA and biochar removed the heavy metal concentration by 60%.

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Sensitivity Analysis of Aquifer Thermal Energy Storage

Steffy Maria Simon[1]
[1]Assistant Professor, Department of Civil Engineering, IES College of Engineering, Chittillappilly, Thrissur, Kerala

Abstract – Being a heat source or sink, aquifers have been used to store large quantities of thermal energy to match cooling and heating supply and demand on both a short-term and long-term basis. The current technical, economic and environmental status of aquifer thermal energy storage (ATES) is promising. Numerous projects in operation, around the world, are summarized to illustrate the present status of ATES. Hydro geological-thermal simulation has become an integral part of predicting ATES system performance. Numerical models which are available to simulate an ATES system by modeling mass and heat transport in the aquifer have been summarized. This also presents an example of numerical simulation and thermo hydraulic evaluation of a two-well, ATES system operating under a continuous flow regime.

INTRODUCTION

As the demand for energy increases, effective or enhanced energy conservation is crucial. Around the world, Thermal Energy Storage (TES) system applications have been shown to provide economical and environment friendly solutions to energy problems. Hence increasing attention has been paid to their utilization. The principle of Aquifer Thermal Energy Storage is to take advantage of the thermal capacity of both the geological formations and the water they contain: groundwater is used both as a reservoir and a vector of energy. Geological materials constitute favorable environment for energy storage as they present low thermal conductivities leading to a slow diffusion of energy and moderate thermal losses .The environments of consideration are mainly quite shallow aquifers, lying in few ten meters depth, and where the groundwater temperature remains quite constant over the year (close to the annual mean temperature of the outside air at the site). The Aquifer Thermal Energy Storage installation is based on the use of a geothermal doublet that means a pair of Water wells, one “hot well”, and one “cold well”. The system is said reversible, as each aquifer is used alternatively in pumping or injection according to the season.

AQUIFER CHARACTERIZATION FOR ATES

To determine the suitability of an aquifer for thermal energy storage, a characterization of the aquifer must be performed. Aquifer characterization for an ATES project typically entails a detailed assessment of the aquifer in terms of its geology, physical properties, flow characteristics, and water chemistry. These characteristics are the same as those assessed for most environmental investigations or water supply studies. Aquifer characterization for an ATES project typically involves phases of desktop review, drilling, hydraulic testing, and modeling, although the level of complexity of these characterization steps can vary considerably depending on how much information is known about the local geology/hydrogeology and how large the ATES system will be.

A. Geology and Aquifer Thickness

The physical makeup of the sediments or rocks and depth, aerial extent, and thickness of permeable and impermeable geological units both at a regional scale and locally at the proposed ATES site, will be of primary importance in determining the nature and distribution of aquifers in the subsurface. The majority of thermal storage projects use unconsolidated aquifers as storage media. However, unfractured and highly fractured bedrock aquifers also can be used for thermal energy storage. In these aquifers, the mapping of structural features, (such as fractures and faults that strongly impudence fluid how), will be important.

B. Hydraulic Properties and Groundwater Flow

The effective porosity and the hydraulic properties (hydraulic conductivity and septic storage) are of primary importance to the design and evaluation of ATES systems. The effective porosity refers to the system of interconnected void space in

the porous aquifer media and is important in determining the amount of heated or chilled water that can be stored per unit volume of the aquifer. The hydraulic conductivity is a measure of the ability of the porous medium to transmit water.

C. Thermal Properties and Ground Temperature Field

The physical processes of conduction (diffusion) and convection govern the transport and storage of heat in an aquifer. Conductive heat transport refers to the movement of heat along a thermal gradient, while convective heat transport refers to the movement of heat by moving groundwater. In an ATES system, conductive heat transport occurs due to the temperature gradients induced by warmer or cooler storage water coming into contact with the surrounding aquifer water.

Regional groundwater flow is an important consideration in the design of ATES systems as higher groundwater flow regimes can lead to advection or down-gradient 'drift' of stored energy beyond potential recovery regions. In the presence of a steep regional gradient in hydraulic head, which would correspond to faster groundwater flows, a lower permeability aquifer is required to minimize convective losses (dispersion reduces the thermal intensity of the recovered plume). In addition, small-scale vertical and horizontal variations in hydraulic conductivity or heterogeneity in the aquifer that result from changes in geology are important, as these will affect the dispersion of the thermal plume.

D. Groundwater Chemistry

The chemistry of aquifers often represents a significant problem in the design of ATES systems. The primary problems related to groundwater chemistry include: (1) the precipitation of minerals such as calcium carbonate, and iron and manganese oxides, which result in the scaling of heat exchangers and clogging of wells; (2) the corrosion of piping and heat exchangers by ambient and heated groundwater; (3) befouling of the well intake area; and (4) the clogging of the aquifer as a result of precipitation of minerals within the aquifer or the transport of precipitates into the aquifer. These problems are avoidable if consideration of the potential for geochemistry problems is considered in advance of the system design phase. Many design strategies and water treatment technologies have been used to mitigate these problems

.

SENSITIVITY ANALYSIS THROUGH NUMERICAL MODELLING

The objective of the pre-feasibility study was to evaluate and prioritize the effects of different factors that can influence the feasibility and the efficiency of ATES. Some theoretical studies have already been done to determine the influence of physical parameters, and have led to the edition of graphs for dimensionless variables. If these curves can be used to obtain a quick evaluation of feasibility of ATES for a given configuration, they are nevertheless of limited help as they are generally based on oversimplified hypothesis (simple geometry of aquifer, etc.). Numerical modeling is then essential to take into account more complex aquifer geometries, density effects, etc., and to evaluate the evolution of hot and cold groundwater stocks in space and time.

3.1.1 Grid

A numerical study was led with Modelling Aquifers with an irregular Rectangular grid, Transport, Hydrodynamics and Exchanges (MARTHE) model, finite-volume software developed by Brgm that can model both hydrodynamics and thermal transfers. The model composed of 10000 cells with varying size. A finer nested grid is included close to the well to obtain a better definition of the thermal storage.

In the simulations presented below, the axis of the geothermal doublet was supposed to be transversal to the regional aquifer flow. In the vertical direction, the terrain is subdivided into 17 horizontal layers with varying thickness. As shown in Figure 3, outside air temperature is prescribed on the first layer of the cover. The aquifer part is represented by three layers. The vertical water movements due to density phenomenon have been considered as negligible for the considered range of temperature (from 10 to 30°C).

3.1.2 Modelling parameters

Simulations were realized with a weekly time step, for 15 yearly cycles (180 months) following the exploitation schedule presented above. The computer CPU time for 15

Years of exploitation were about 3 hours on a standard desktop PC. The initial temperature of the aquifer is 14.5°C (annual mean air temperature).

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Table 1: Range of parameters that have been tested by modelling.

Parameter	Unit	Range
Cover thickness	m	5-30
Aquifer thickness	m	10-30
Substratum thickness	m	30
Hydraulic conductivity	m/s	$5x10^{-4}$-$2.5x10^{-2}$
Hydraulic gradient	%	0-2
Distance between wells	m	150-200
Aquifer calorific capacity	$J/m^3/°C$	$1.84\text{-}2.09x10^6$

3.1.3 Methods to compare simulations

The basic principle of a sensitivity analysis is to make the different parameters varying one by one and to compare the obtained simulations results. In this study, several methods have been used to compare the simulations, in order to evaluate the relative influence of the different parameters on ATES efficiency.

The "global" thermal power that can be furnished by water is proportional to water discharge and temperature following the equation (5.1):

$P_g=g_f.Q.T$ Eqn (5.1)

Where Pg, gf, Q, T are "global" thermal power, fluid calorific capacity, discharge and temperature, respectively. The model gives the time evolution of temperatures simulated in the cells containing respectively the hot and the cold wells. As these temperatures will condition the thermal power, the simulations are compared through:

- the temperatures simulated at the end of the 4 months pumping cycle,
- the deviation with the natural aquifer temperature,

  The number of yearly cycles necessary to obtain the stabilization of the temperatures obtained in the hot
- And cold wells at the end of the 4 months pumping cycle.

The MARTHE model allows also the simulation of the spatial distribution of the temperatures in the aquifer. For the different simulations, these are compared for some key dates of the yearly exploitation cycle (end of pumping cycle, end of rest period, etc.).

RESULTS AND DISCUSSIONS

4.1 Influence of aquifer regional flow

Aquifer regional flow is one of the most important parameters that will condition the efficiency of ATES. It will depend on the permeability K, and on the hydraulic gradient, i. The graphs below show the comparison of two simulations with and without aquifer regional flow.

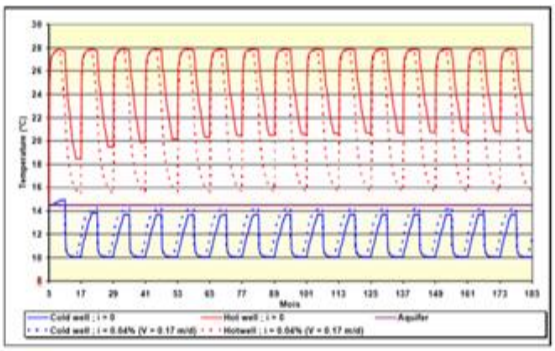

Figure 4: Comparison of the simulated temperatures in the cold and hot wells for i = 0 (V = 0), and i = 0.4‰ (V = 0.17 m/d) ; Q = 50 m3/h, Aquifer thickness = 25m, Cover thickness = 20m, K = 5.10-3 m/s, e = 15%.

Figure 4 shows the temperatures simulated in the cells containing the cold and the hot wells. The strong effect of aquifer flow can also be clearly seen, through quicker increase (in the cold well) and decrease (in the hot well), of pumped water temperatures after the end of the 4 months injection period. For the 15th simulation year, the gain in temperature (compared to the natural aquifer temperature) at the end of the 4 months pumping period is:

- in the hot well, +6.3°C and +1.7°C, without and with aquifer flow, respectively,
- in the cold well, +0.8°C and +0.4°C, without and with aquifer flow, respectively.

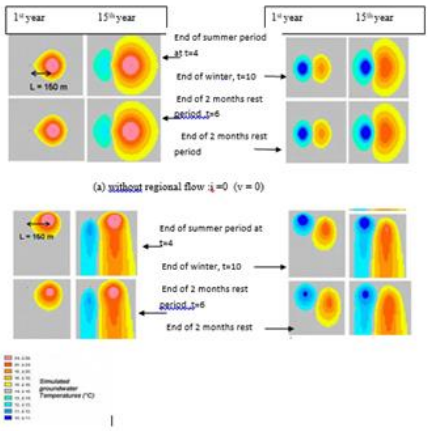

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Fig 5: Comparison of spatial spreading of cold and hot stock without (a) and with (b) regional flow i = 2‰, V = 0.86 m/d

Figure5 shows comparison of cold and heated groundwater stocks for the first and the 15th years of exploitation, and for different key dates of the yearly cycle. It appears clearly that the thermal storage has increased over the years, leading to an amelioration of the efficiency. The comparison of the first case without regional flow (which, in fact, never happens in reality) and the second one with a flow of 0.86 m/d is eloquent, as it shows the moving and spreading out of the heated and cold water. The influence of natural aquifer flow on the ATES efficiency can be evaluated on the curves of "useful" thermal power, shown below (Figure 5.5).

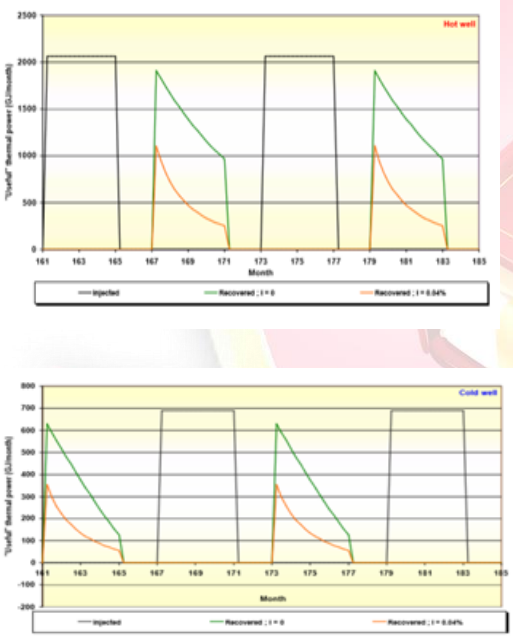

Figure 6: Comparison of simulated "useful" thermal power in the cold and hot wells for i = 0 (V = 0), and i = 0.4‰ (V = 0.17 m/d) It appears clearly that the recovered thermal powers are strongly affected by the aquifer flow. Compared to the theoretical case without flow, the recovery factors calculated on the 15th simulation year decrease from 67% to 26% in the hot well, and from 53% to 22% in the cold well.

Table 2: Summary of simulations results for i = 0 and i = 0.4%

Parameters		Hot well		Cold well	
i (%)	V(m/d)	ΔT(°C)	ɣ (%)	ΔT(°C)	ɣ (%)
0	0	+6.3	+67	+0.8	+53
0.4	0.17	+1.7	+26	+0.4	+22

4.2 Influence of the cover thickness

Cover thickness will play a role of thermal insulator and reduce the exchange by conduction towards the surface. Figure 5.6 and Figure 5.7 show that the results are slightly better in terms of recovered temperatures and "useful" thermal powers for a cover 20m thick compared to 5m.

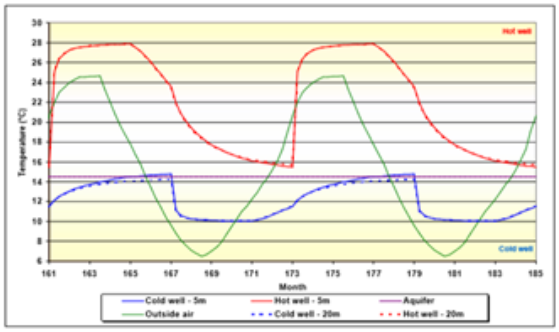

Fig 7: Comparison of the simulated temperatures in the cold and hot wells for cover thickness 5 and 20m ; Q = 50 m 3/h, L = 200m, Aquifer thickness = 25m, Cover thickness = 20m, K = 5.10-3 m/s, e = 15%, i = 0.4‰.

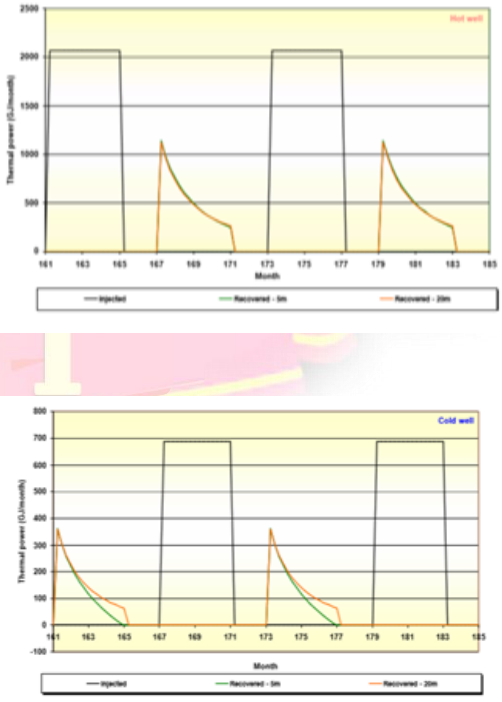

Figure 8: Comparison of simulated "useful" thermal power in the cold and hot wells for coverthickness 5 and 20m

Table 3: Summary of simulations for cover thickness 5 and 20m

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Parameters	Hot well		Cold well	
Cover thickness	ΔT (°C)	ɾ (%)	ΔT (°C)	ɾ (%)
5 m	+1.6	+27	+0.0	+19
20 m	+1.7	+26	+0.4	+23

4.3 Influence of the distance between the wells

Distance between the two boreholes of the geothermal doublet is also an important parameter to take into account. Figure 5.8 shows the evolution of simulated temperatures in the hot and cold wells for two distances of 150 and 200m, in a case of a 50 m^3/h exploitation discharge. The interference between the heated and cold groundwater is greater when the boreholes are closer, this is to be seen almost in the temperatures of the pumped waters at the end of the 4 months pumping cycles. The interference is especially marked on the cold well, as shown on the "useful" thermal power. With a 150m distance, the recovered thermal power in the cold well is hardly decreased by the influence of the hot well, where a greater quantity of energy is stored.

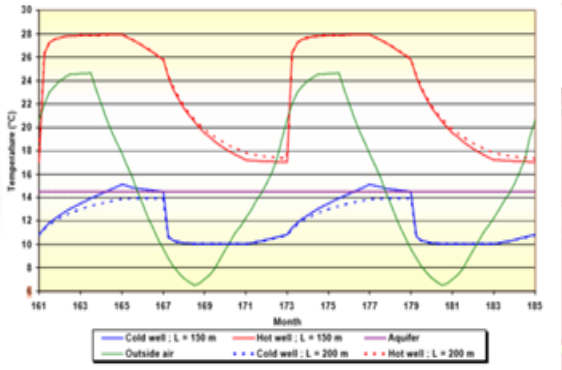
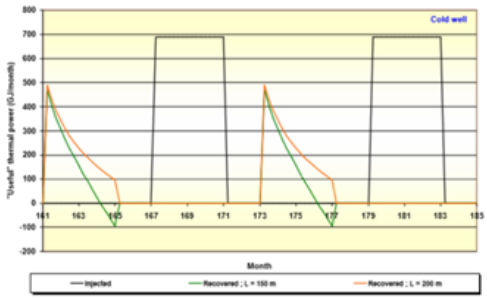


Figure 9: Comparison of the simulated temperatures in the cold and hot wells for L = 150m and 200m, i = 0.4‰; Q = 50 m3/h, Aquifer thickness = 10m, Cover thickness = 20m, K = 5.10-3 m/s, e = 15%.



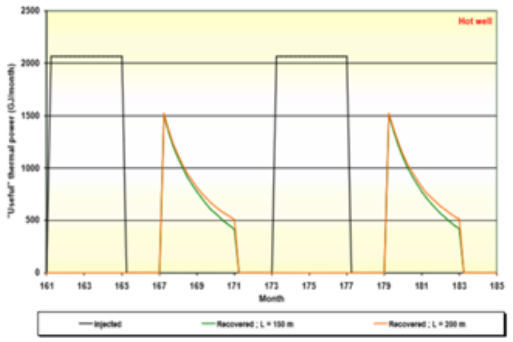


Figure 10: Comparison of simulated "useful" thermal power in the cold and hot wells for L = 150 and 200m

Table 4: Summary of simulations for L = 150 and 200m

Parameters	Hot well		Cold well	
Distance ,L (m)	ΔT (°C)	ɾ (%)	ΔT (°C)	ɾ (%)
150	+2.7	40	-0.6	+22
200	+3.3	42	+0.6	+35

In this simulated case with a 50 m 3/h discharge, we can conclude that it is better to install the boreholes on a distance greater than 150m. The "minimal" distance between boreholes depends on the thermal radius of the stored water, which depends itself both on the aquifer thickness, and on the water discharge. A given distance could be sufficient for a discharge, and not for a greater one. In real case, a compromise may have to be found between large distances to avoid reciprocal "thermal pollution" of the two stocks, space availability and disposition constraints on the agricultural site, and additional costs of equipments with the distance (piping lengths, greater hydraulic losses leading to larger pipes diameters, etc.).

CONCLUSIONS

Thermal efficiency is on the whole better in the hot well than in the cold one, due to the fact that the stored quantity of energy is greater, and that, in certain cases, the stock of heated water has a strong influence on the cold one. This sensitivity analysis revealed that same parameter can have positive and negative effects on the storage, or can have a positive effect in a given range of values, and a negative one in another one, depending on the values of the other parameters (as an example, the increase of the exploitation discharge can produce a positive or a negative effect depending on the

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aquifer thickness and on the distance between the boreholes). This interdependence between the parameters is clearly shown on this sensitivity analysis, where the recovery ratio varies from negative values to very significant ones (+74%). The conclusion to retain is that each site will be a particular case, requiring a detailed dimensioning as a function of its hydro geological context.

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Failure Analysis and Repairing Methods of Prestressed Concrete Girders

Glynez Joseph[1], Anjali Baby[2]
[1,2]Assistant Professor, Department of Civil Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala

Abstract – demands associated with degradation of bridge infrastructure coupled with the rise in fuel and material costs have made structural repair and retrofitting a more attractive solution to fix aging, damaged and failing structures. Laboratory tests and field tests of damaged prestressed girders have done with three different repair materials including carbon fiber, glass fiber, and surface mounted rods. Each different repair material was also tested with and without injected epoxy.

Index Terms – Prestressed Concrete, Post-damage Repair, Shear Strengthening, FRP, Surface Mounted Rods

Introduction

Environmental effects consist of expansion and contraction due to absorption of moisture. This causes the concrete to crack and may lead to significant damage or failure [1]. External post-tensioning and strand splicing are some common techniques used to repair impact damage, but these methods may perform poorly under fatigue loading and are susceptible to corrosion problems. The use of fiber reinforced polymer (FRP) materials like carbon FRP, glass FRP, aramid FRP and surface mounted reinforcement FRP, solves these problems, and can restore the ultimate strength and displacement capacity of the original girder. Several impact-damaged prestressed concrete girders have been repaired using FRP in the field as well as laboratory [2].

Environmental effects include temperature effects due to absorption of moisture followed by a freeze–thaw cycle [6]. This causes the concrete to crack and finally will lead to significant damage or failure. End region concrete deterioration of prestressed concrete girders tends to the Expansion joint located at the deck level above the beam end fails.

The objective is to investigate the feasibility of methods to repair end damage in American Association of State Highway and Transportation (AASHTO) prestressed concrete bridge girders. The damage in the girders is shown in the Fig. 1.

Fig. 1 Damage in the girders

The studies have shown that FRP repair systems can reduce displacements at service load levels, successfully restore the capacity after large losses of concrete section, and perform well under service loads after loss of a small number of ruptured prestressing strands.

A. POST DAMAGE REPAIR

Repairs are begun by removing the loose concrete from the ends of the beams. Rapid set cement is added to ends where there is a significant amount of missing concrete (Fig.2).

Fig.2 Post Damage Repair

After that epoxy will be injected to the beam. To accomplish this, toothpicks should be placed in the cracks then small tubes are placed over the toothpicks.

Once the epoxy will be cured the putty and tubes are ground off so the surface is smooth. Two types of FRP sheets can be applied: carbon FRP and glass FRP. The fiber was soaked in a saturate then place over the primer and putty. Rollers are used to remove surface imperfections. Grooves are cut in the beams and metal rods were placed in them to hold the fiber sheets in place. After that top coat is applied. It is applied mainly for aesthetic purposes so the repair is not noticeable while driving past the structure.

III. EFFECTS OF CFRP METHOD

Carbon fiber reinforced polymer (CFRP) sheet, is a type of Fiber Reinforced Polymer, which gains strength by impregnating carbon fibers sheets with a polymer matrix composite material. The major advantages of CFRP sheets include corrosion resistance and high tensile strength, ease of construction and impact is less to the original geometry. Thus, CFRP sheets were widely used for retrofitting of reinforced concrete (RC) members by making bond to the external surfaces.

A. TEST SET UP

The girders were tested using a 2000 kN hydraulic actuator mounted to a steel frame at midspan. The fatigue testing of girder was performed using a 510 kN hydraulic actuator Selected based on its large capacity servo valve which permitted testing of the girder using a frequency of 2 Hz. The loading contact area was a 250 mm by 500 mm steel plate specified by AASHTO. Neoprene pads 560 x 230 x 64 mm were used between two 25 mm steel plates to simulate field supporting conditions and to support the girder. The displacement profile along the length of the repaired AASHTO girders was measured using string potentiometers placed at L/8 points [2].

The tensile strain in CFRP reinforcement was measured using 6.0 mm electrical resistance strain gauges. Placement of the instrumentation measuring compressive and tensile strains was carefully selected to determine: 1) The strain profile of the section at midspan, 2) The behavioral differences between the damaged and undamaged sections, and 3) The tensile strain in the CFRP to determine the characteristics of bond throughout the longitudinal CFRP.

B. TEST RESULTS

Repaired girder AASHTO1 was tested for several stages to failure. During the final cycle at a load of 510 kN a flexural crack just outside the CFRP repair area extended into the web. Due to the presence of the longitudinal CFRP struts the cracks in the damaged region did not extend into the web.

TABLE I

CFRP SYSTEM PROPERTIES

Specimen Designation	AASHTO1	AASHTO2	AASHTO3
Thickness, mm	2.3	2.4	2.4
Ultimate Strength, MPa	436	751	751
Modulus of Elasticity	60000	67100	67100

The loading of girders AASHTO2 and AASHTO3 consisted of several different stages: 1) initial loading, 2) loading after damage, and 3) final static loading to failure. Initially, the girders were loaded up to a load level approximately 80 to 90 percent of ultimate flexural capacity, applied using displacement control loading [4]. Since these girders arrived at the testing facility relatively undamaged, this loading was selected to simulate an extreme impact event upon the girder, Where the girder normally becomes heavily cracked. The second stage of loadings was performed to determine the change in stiffness of the girder due to the rupture of

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prestressing strands and simulated impact damage of concrete removal. The transverse U-wraps buckled at failure but contained most of the concrete damage [3]. For the three girders repaired in flexure with CFRP sheets, the original ultimate load capacity was exceeded with the repaired section while preserving ductility. An AASHTO girder repaired in flexure with CFRP sheets can withstand over 2 million cycles of fatigue loading.

SHEAR-STRENGTHENING OF PC BEAMS USING CFRP

In order to see the effects of the added shear capacity of CFRP, a total of three prestressed concrete beams were designed. To ensure that the test specimens failed in shear before flexural yielding, while also keeping the under-reinforced aspect of the beam, reinforcing bars were used in the specimen design [3]. Two 6 diameter longitudinal reinforcing bars with a clear cover of 1.63 in. and two 8 diameter bars with a clear cover of 4in. were placed at the tension face of the specimens, and the two prestressing strands at a clear cover of 2 in. On the compression face of the specimen, two 4 diameter bars were placed at a clear cover of 1.5 in. to enhance the overall ductility of the specimen.

A. TEST SETUP

An automated hydraulic actuator having a load capacity of 500 kips was used to test all three specimens. The specimens were simply supported and were tested on a four-point loading system. The roll of carbon fiber was cut into strips 53 in. long and 3 in. wide, the fibers would be placed on the test specimens. The watering method was used to apply the carbon fiber to the test beams.

B. TEST RESULTS

All three prestressed test specimens were subjected to a four point loading system and failed as expected in a shear failure. The specimens showed diagonal shear cracks that initiated from the supports up to the loading points. Shear cracks were noticed as they appeared on the specimen along with the corresponding loadings during the test. The externally applied CFRP strips in prestressed concrete beams for shear-strengthening improved the overall shear capacity of the specimens, when the spacing was less than half the effective depth of the beams.

The spacing has not only increased the ductility of the beam by 28% but has also increased its shear capacity by 38% compared to the shear capacity of the control beam. Additionally, special attention should be paid to properly bond the CFRP and concrete at inside angle of a beam.

V. EFFECTS OF GFRP METHOD

The Prestressed concrete beams were strengthened with Glass Fiber Reinforced Polymer (GFRP) plates with different configurations and thicknesses of 3 mm and 5 mm. The beams were tested under a static gradual loading to examine its flexural behavior.

A. MATERIAL PROPERTIES

Concrete mix was prepared using OPC of 53 grades having a specific gravity of 3.15. River sand was used as fine aggregate. It is passed through 4.75 mm sieve with a specific gravity of 2.63. In accordance with IS 383, the grading zone of fine aggregate was Zone II. The coarse aggregate was crushed granite of 20 mm size and it has the specific gravity of 2.77. The glass fiber reinforced polymer (GFRP) plates of different configurations viz., chopped strand mat glass fiber reinforced polymer and Uni-directional Cloth glass fiber reinforced polymer with different thicknesses. The thicknesses may in the range of 3 mm and 5 mm were used for strengthening the unbounded post tensioned concrete beams.

B. BEAM PREPARATION

The test consists of five prestressed concrete beams of dimensions of 150 mm x 250 mm which having a length of 3000 mm. Before concreting, the non-prestressed reinforcements were insulated with strain gauges and adequate water proofing was provided. The reinforcement cage was installed in the steel moulds for concrete casting. After curing the beams, it was made ready for prestressing operation.

C. TEST PROCEDURE

The PSC beams were tested under four point bending and the load was applied statically at rate of approximately 2 kN/min. Linear variable displacement transducers (LVDTs) were used to measure deflection of different beam specimens. Deflection, Loading, and strain gauge measurements were recorded through a data acquisition system. At each load stage, the crack patterns were also noticed.

D. TEST RESULTS

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The experimental results observed that the FRP strengthened post-tensioned concrete beams, it was found to be very effective in the deflection, load carrying capacity and ductility when compared to the reference beam specimen. FRP improves post-tensioned beam specimens provided a maximum increase in ductility to a level of about 90%.

The unbounded post-tensioned concrete beam specimen was failed by yielding of tension steel reinforcement, and it is followed by crushing of concrete. The failure of strengthened prestresssed concrete beam specimens occurred by rupturing of FRP and by FRP deboning.

TABLE II

SUMMARY OF TEST RESULTS

Beam Specimens	Yield Load (kN)	Ultimate Load (kN)	Deflection at Ultimate Load (mm)
B1	20.6	59.5	42.0
B2	23.2	69.4	50.0
B3	33.7	85.2	68.0
B4	36.1	97.5	75.5

VI. POST-DAMAGE REPAIR IN CFRP

Repairs of beams were done by removing the loose concrete from the ends of the beams. One end of each beam was epoxy-injected. After that putty and primer was applied for getting smooth surface. Two types of FRP sheets were applied and they are carbon FRP and glass FRP. The fiber was soaked in a saturated liquid then placed over the primer and putty. Rollers were used to remove surface imperfections. Grooves were cut in the beams in order to hold the fiber sheets in correct place.

TABLE III

REPAIR TYPE AND LOADINGS BEFORE AND AFTER REPAIR

Specimen ID	Peak Load during initial bending Test	Type of Repair	Peak load during post-repair bending test
1	312	Carbon-FRP	300
2	251	Glass-FRP	162
3	283	Surface mounted rods	170

It was decided to the use of five sets of stirrups on each end, to complete the repairs. Threaded steel rods with a diameter of 19 mm were used in conjunction with 76 × 76 × 6.35 mm.

CONCLUSIONS

Fiber repair/strengthening systems have a number of advantages over traditional repair/strengthening schemes for impact damaged prestressed girders. FRP is lightweight and relatively simple to install in the field. In addition to its high tensile strength, CFRP sheets also have excellent corrosion/fatigue properties. The CFRP repair system exceeded the strength and ultimate displacement of the original capacity prior to damage. The externally applied CFRP strips in prestressed concrete beams for shear strengthening improved the overall shear capacity of the specimens, when the spacing was less than half the effective depth of the prestressed concrete beams. The FRP strengthened post-tensioned concrete beams was found to be very effective in the deflection, load carrying capacity and ductility. Epoxy injections in repair methods provide a degree of help over beam ends not injected with epoxy. The epoxy supplies an amount of stiffness and stability to an end that has been injected. The surface mounted rods provide the greatest potential for strength recovery. The carbon FRP has the largest amount of stiffness recovery and the glass FRP has the greatest percentage of overall strength recovery.

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ANALYSIS AND DESIGN OF G+4 RESIDENTIAL BUILDING

Glynez Joseph[1], Rubeena[2], Savin Krishna.P[3], Sajeev[4], Shahana Ashraf[5]
[1]Assistant Professor, Department of Civil Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala
[2,3,4,5]Assistant Professor, Department of Civil Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala

Abstract – ETABS is the expansion of extended three dimensional analysis of building system. This project carried out for analyzing and designing of multi stored residential building using ETABS. In this structural analysis which involves designing and planning to built up a perfect building in systematic manner with lateral loading effect of earthquake using ETABS. This analysis is done by considering soil properties including type of soil, bearing capacity etc and also provides perfect parameters in load, beam, column etc to avoid shear and bending collapse. This project is based on Indian code IS 456 2000.

Key words: ETABS Software Tool, Seismic Analysis, Multi-Storied Residential Building.

INTRODUCTION

At present day ETABS is one of the leading design software in market. Multiple companies' use tabs software for their project design purpose. So this paper leads with the design and analysis of the G+4 residential building using ETABS software. The dynamics character of structure and intensity, duration and frequenting content of ground motion are the concern for structural response to earthquake [1]. Structural analysis means finding the general shape and all specification of particular structure. And it performs the function and will safely withstand the influence which will act on throughout its useful life. The earthquake structure's construction and design has played a major role and have importance all over the world. According to geographical statistics, 54 % of India's land is vulnerable to earthquakes. This project of design and analysis of the G+4 residential building using ETABS software with lateral loading effect. The analysis is done by considering severe seismic zones and the behavior is assessed by taking soil profile and conditions.

In this paper, from the plinth to the certain height of Building the size of the column may be different, and that is more than the upper column because it reduce failure in structure. The local eccentricity is avoided by main beams resting on the column [2].

The Comparison of analysis and design of the regular and irregular configuration of the G+4 residential building using ETABS software.

The centre of the mass is unique point at the centre of distribution of mass in space. The centre of mass in space is unique point where weighted relative position of distributed mass sum is equal to zero.

METHODOLOGY

Planning and designing consist of 5 steps

1. Data collection
2. Drawing in Auto-Cad
3. Designing of concrete member
4. Detailing of residential building
5. Analysis in ETABS

ETABS

ETABS which is a 3D modeling software and is used for the structural design and analysis. This software for concrete structure design by the civil engineers all over the world. It is advanced software and is simple to use. It allows graphic input and modification thus ensuring easy and quick model creation of structure. We can also create 3D model of any kind of complex structure. If the stories are similar then model generation time can be reduced to multiple times, also editing of model is very easy using this software. The creation of an object is very quick at one click of the mouse.

Advantages of ETABS

1) Graphic input and editing for easy and fast model generation

2) 3D view with zoom and plan capability

3) Multiple viewing windows

4) Fast object creation with one click of the mouse

5) Accuracy in dimensions using snaps

6) 3D generation of the model through plan views and elevations

7) Easy editing through the move, merge, mirror and copy commands.

AUTO-CAD

Auto-Cad is the computer aided software which is developed by Autodesk, which allows the easy and quick drawing and editing of 2D and 3D digital design [3]. The files processed can be easily accessed from anywhere at any time since it can be stored in the cloud. Few other benefits are easy editing, faster production, and better accuracy.

2.3. Project Description

Firstly we will fix the beam and column layouts and the modeling will be carried out using ETABS software [4]. The load calculations will be done using the IS codes during the analysis. An equilibrium check on support reactions is made to ensure the analysis correctness. Various load combinations from the analysis was taken during the analysis [5].

3. ANALYTICAL RESULT

In the project we considered G+4 Residential building. The ground floor plan and typical floor plan was shown in the figure below.

Fig.1 Typical Floor Plan

Fig.2 Ground Floor Plan

The analytical results of shear force diagram and bending moment diagram were shown in the given figure.

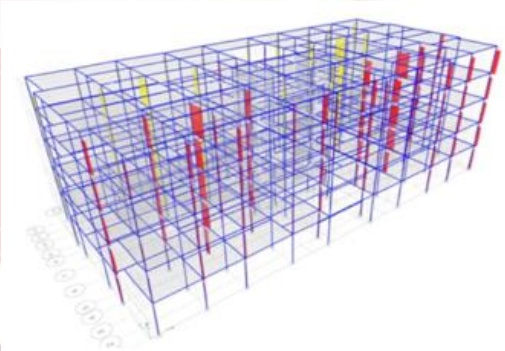

Fig. 3 Shear Force Diagram

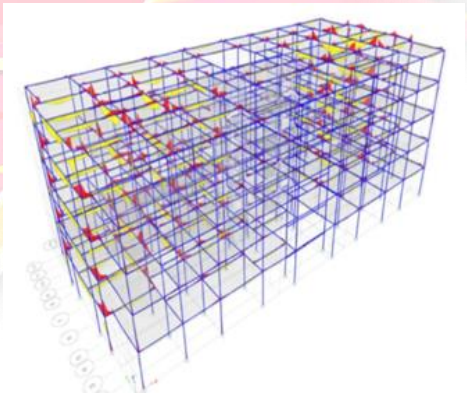

Fig.4 Bending Moment Diagram

3.1 Loads on Buildings

Dead Load

All permanent construction from the structure forms the Dead Loads. Dead Loads shall be calculated on the basis of unit

weights which shall be established taking in to account the materials specified for construction from IS 875(Part 1) 1987.

Live Load

The imposed loads to be assumed in the design of building shall be greatest loads that probably will be produced by the intended use or occupancy, but shall not be less than the minimum loads specified in IS 875 (Part2) 1987.

Combination Load

A load combination results when more than one load type acts on the structure. Building codes usually specify a variety of load combinations together with load factors (weightings) for each load type in order to ensure the safety of the structure under different maximum expected loading scenarios.

TABLE: Beam Forces

Story	Beam	Load Case/Comb	Station	V2	M3
			m	kN	kN-m
Story5	B321	Dead	4.175	24.4803	-17.8227
Story4	B426	Dead	6.11	28.8687	-26.2092
Story3	B426	Dead	6.11	29.1278	-26.3804
Story2	B426	Dead	6.11	29.4608	-26.7903
Story1	B426	Dead	6.11	29.5284	-26.5296
Story5	B78	Live	0.3	15.1511	-1.2768
Story4	B78	Live	0.3	15.3145	-1.6494
Story3	B78	Live	0.3	15.4262	-1.3541
Story2	B78	Live	0.3	15.6597	-1.0508
Story1	B105	Live	0.115	15.9279	-0.0119
Story5	B78	Comb1	0.3	65.0377	-3.445
Story4	B78	Comb1	0.3	66.2748	-3.7719
Story3	B78	Comb1	0.3	66.8311	-2.3956
Story2	B78	Comb1	0.3	67.6809	-1.1459
Story1	B105	Comb1	0.115	68.1843	0.0586
Story5	B78	Comb2	0.3	53.0394	-1.7588
Story4	B78	Comb2	0.3	54.2807	-1.4528
Story3	B78	Comb2	0.3	54.7289	-0.035
Story2	B78	Comb2	0.3	55.3197	1.1265
Story1	B105	Comb2	0.115	55.4176	0.3218

Fig. 5 Beam Forces

TABLE: Column Forces

Story	Column	Load Case/Combo	Station	P	V2	V3	M2	M3
			m	kN	kN	kN	kN-m	kN-m
Story5	C18	Dead	0	-138.5759	0.9327	-33.641	-41.3194	1.4683
Story4	C15	Dead	0	-284.2336	5.0497	-13.8827	-20.9329	7.8806
Story3	C15	Dead	0	-424.3943	5.3369	-13.8599	-20.5739	7.9143
Story2	C15	Dead	0	-566.6319	5.0241	-14.1961	-21.5372	8.0383
Story1	C18	Dead	0	-680.549	0.0823	-11.6636	-10.9037	0.7214
Story5	C14	Live	0	-59.8034	2.8192	7.5522	10.5855	3.4459
Story4	C14	Live	0	-115.2741	1.6273	6.204	9.3593	2.5827
Story3	C15	Live	0	-171.5313	1.7708	-6.2916	-9.3583	2.556
Story2	C14	Live	0	-230.0071	1.8008	6.259	9.5049	2.7964
Story1	C14	Live	0	-290.3705	0.8921	2.8633	3.0237	0.9042
Story5	C18	Comb1	0	-291.4248	-0.2286	-75.9856	-93.4935	0.01
Story4	C15	Comb1	0	-598.6083	10.0448	-30.356	-45.784	15.7421
Story3	C15	Comb1	0	-893.8884	10.6615	-30.2272	-44.8984	15.7053
Story2	C15	Comb1	0	-1193.6971	10.2708	-30.8189	-46.7797	16.3065
Story1	C23	Comb1	0	-1146.4975	5.2374	-11.6612	-9.2015	6.4965
Story5	C22	Comb2	0	-180.5578	11.6742	34.7745	43.2745	16.3351
Story4	C15	Comb2	0	-480.0678	8.6628	-23.3989	-35.2958	13.5393
Story3	C15	Comb2	0	-717.0179	9.2098	-23.3109	-34.5995	13.6192
Story2	C15	Comb2	0	-957.5012	8.8197	-23.9183	-36.2804	14.067
Story1	C18	Comb2	0	-1153.5185	-0.3055	-19.1882	-15.7418	0.6491

Fig.6 Column Forces

CONCLUSIONS

After designing and analyzing of G+4 Residential building, it is concluded that the structure is provision to earthquake resistant which is economical. This structure is safe in loading conditions like live load, dead load, seismic load and wind load. AutoCAD plans gives complete detailed information of the members including size, height, numbers, size etc. The analysis is done by ETABS software which includes bending moment, shear capacity etc. This project contains number of parameters which are designed as per IS 456(2000).

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Multifunction Equipment for Early Detection of Leakage from Soil Mining

Nayana T Thankappan[1], Sreekumar N.R[2]
[1]PG Student, Department of Civil Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala
[2]Assistant Professor, Department of Civil Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala

Abstract –The soil thermal and electrical properties and moisture content change due to heavy metals in the soil environment. Moisture or humidity detection is the primary leakage detection method, but there may be variation in the moisture content of soil around due to various other reasons, such as rainfall or change in groundwater table, which gives inconsistent warning. In the present study multifunctional equipment is fabricated that estimates soil thermal resistivity, electrical resistivity and the moisture content in the soil. The thermal probe was calibrated using standard glycerol and the electrical probe was calibrated using sodium chloride and potassium chloride solution. A Laboratory model study was conducted the paper presents the findings of a study that aimed at assessing the soil and water quality parameters in the area. Water samples were collected from five different sources during the monsoon season. Representative surface soil samples were collected from the contaminated and no contaminated areas for the study... The equipment will help us in predicting the soil thermal and electrical properties, which can be used to give timely warning if there is any abnormal release/leakage

Keyword: Electricalresistivity, Thermal resistivity, Moisture content

INTRODUCTION

Mining and processing of heavy and rare Earth minerals can produce a tremendously negative impact on the land and environment in the area, the magnitude and intensity of which depends on the kind of chemicals and processes used, the efforts taken in the management of waste as well as on environmental fragility of the location. It can also endanger the health of local residents as well as their livelihoods Through water pollution and destruction of farmland thereby violating the rights of local communities. The soil thermal and electrical properties and moisture content change due to heavy metals in the soil environment. Moisture or humidity detection is the primary leakage detection method, but there may be variation in the moisture content of soil around due to various other reasons, such as rainfall or change in groundwater table, which gives inconsistent warning. In the present study multifunctional equipment is fabricated that estimates soil thermal resistivity, electrical resistivity and the moisture content in the soil. The thermal probe was calibrated using standard glycerol and the electrical probe was calibrated using sodium chloride and potassium chloride solution. A Laboratory model study was conducted. The paper presents the findings of a study that aimed at assessing the soil and water quality parameters in the area. Water samples were collected from five different sources during the monsoon season. Representative surface soil samples were collected from the contaminated and no contaminated areas for the study. The contaminated containing metals like copper, nickel, zinc, lead, chromium strontium, cobalt etc heavy metal loading in the surrounding subsoil. The difference in thermal and electrical resistivity corresponding to moisture leakage and high conductivity fluid solution was identified. The equipment will help us in predicting the soil thermal and electrical properties, which can be used to give timely warning if there is any abnormal release/leakage.

II OBJECTIVE AND SCOPE

The soil thermal and electrical properties change when there is release of heavy metals in the soil environment. So the

objective of the study is to identify and monitor a technique for early detection of abnormal heavy metals releases to the surrounding underground environment, by simultaneously observing the changes in the soil thermal and electrical properties as well as change in the moisture content. A multifunctional equipment is developed that detects the change in soil thermal resistivity, electrical resistivity and the moisture contention comparing with other conventional methods the use of multifunctional instrument will save time and cost. The probes to be used in field should be of minimum 1 m length.

III MATERIALS AND METHODOLOGY

Samples were collected from Chavara-Neendakara coastline of Kollam,The contaminated and non contaminated areas Measurement of thermal resistivity Soil resistivity for different soils has been obtained with the help of a laboratory thermal needle which is developed based on ``transient needle method" For the sake of completeness, the principle of operation is being presented here .The probe consists of insulated nichrome heater wire inserted in a copper tube of 14 cm length and external diameter equal to 2.5 mm. A thermocouple is attached on the surface of the tube (Fig. 1). The calibration of this probe has been done using a standard liquid glycerol with thermal resistivity equal to 349°C cm/W. The thermal resistivity value of the glycerol as measured by this probe is observed to be 357:52°C cm/W, with a small deviation of only 2.4%. A metal container (12.6 cm long and 10.1 cm diameter) is used to prepare the samples of soils corresponding to a particular dry-density. A 3 mm diameter hole is drilled in the soil sample and the thermal probe is tightly it into it. The probe is allowed to achieve thermal equilibrium in the soil mass (which takes approximately 5 min) then the power supply to the probe is switched on. The temperature of the probe is recorded as a function of time to compute the soil thermal resistivity.

Abstract – The sudden increase in population has increased construction activities. And in the present scenario, the construction activities take place in those lands which are of low quality. There are many methods are practiced to increase the performance of soil. Here one of the techniques that are used to improve the performance of low-quality soilisdiscussed.Geosynthetic Reinforcement is one such technique that helps in increasing the soil bearing capacity and helps in the reduction of settlement that is caused by various reasons. Prestressed Geosynthetic Reinforcement is one such technique that helps in increasing the soil bearing capacity and helps in the reduction of settlement that is caused by various reasons. The application of Prestressed Geosynthetic reinforcement results in an improvement in the performance of footing such as circular footing, square footing on various soils such as sandy soil, expansive soil.

Key words - Prestressed Geosynthetic Reinforcement, Bearing capacity, Settlement

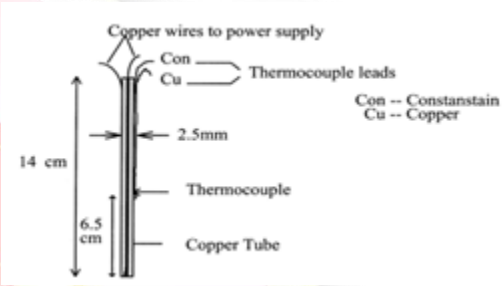

Fig1: Laboratory thermal needle probe

In this project the electrical resistivity measurement is mainly based on Wenner (4-Pin) Array.

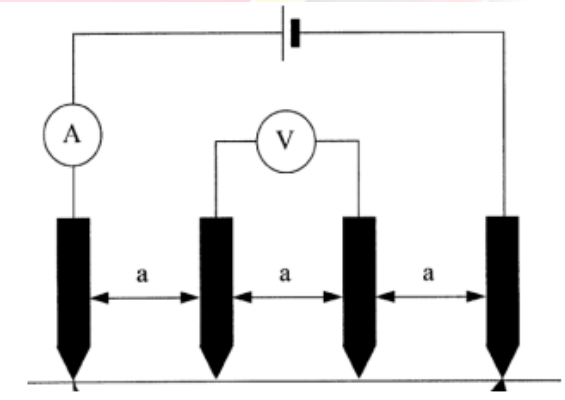

Fig 2: Wenner array configuration

A power supply is used AC having an electrical potential of 35v and a constant frequency of 60HZ.AC is used because application of DC results in electro kinetic phenomena that cause change in water content. A potential difference is measured between two copper rods (dia2mm) that are pressed through the specimen near its center. The vertical spacing of the rod is 3.8cm.A voltmeter with an accuracy of 0.001V is used to measure the potential difference between the

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electrodes. Moisture content measuring Oven-drying technique the oven-drying technique is the most widely used gravimetric methods for measuring soil moisture. This method is a destructive test and requires removing a soil sample from the field. It is the standard method that forms the calibration for all other soil moisture determination techniques. This method ensures accurate measurements but it requires 24 hours of drying time. So it is impossible to obtain soil moisture at the same point in a later date.

IV RESULTS AND DISCUSSION

The test for index properties and engineering of two samples were determined by conducting series of laboratory experiments. Table 1 shows the basic properties of soil collected from Chavara-Neendakara coastline of Kollam, samples were collected from five different sources during the monsoon season. In comparing the test results of non contaminated and contaminated soil which measured using conventional and multifunctional instrument the values are approximately same, for example the electrical resistivity in non contaminated soil measured using conventional method is 424.89 and by measuring it with multifunctional instrument the value is closer to it that is 426.

Table 1: Basis properties of soil

Soil Properties	Values
Uniformity coeffient C_U	2.66
Coefficient of curvature C_c	0.806
Specific gravity,g	2.66
Liquid limit(%)	26.60
Plastic limit(%)	23
Plasticity index(%)	3.6
Optimum moisture content(%)	13
Max dry density (g/cc)	21.43
Permeability (cm/s)	0.0091
Ucc (KN/M^2)	46.85

Table 2: Non contaminated soil

Non contaminated soil	Conventional method	Multifunctional equipment
Electrical resistivity	424.89	426
Thermal resistivity	429.83	430
Moisture content	10	10

Table 3: Contaminated soil

Contaminated soil	Conventional method	Multifunctional equipment
Electrical resistivity	412.89	412
Thermal resistivity	458.93	460
Moisture content	10	10

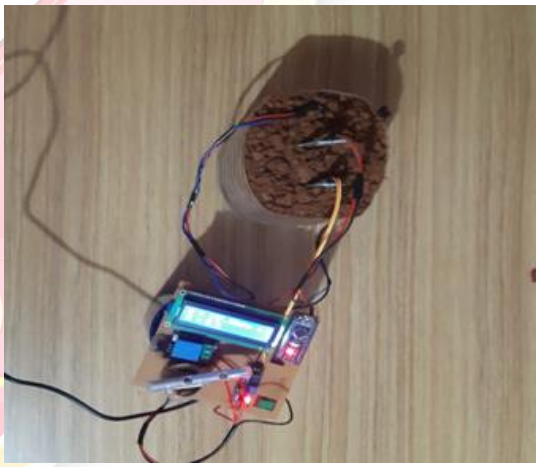

Fig3: Multifunctional instrument

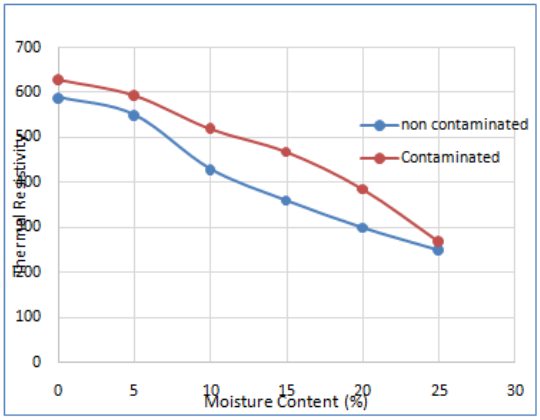

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Fig4: Thermal resistivity Vs Moisture content

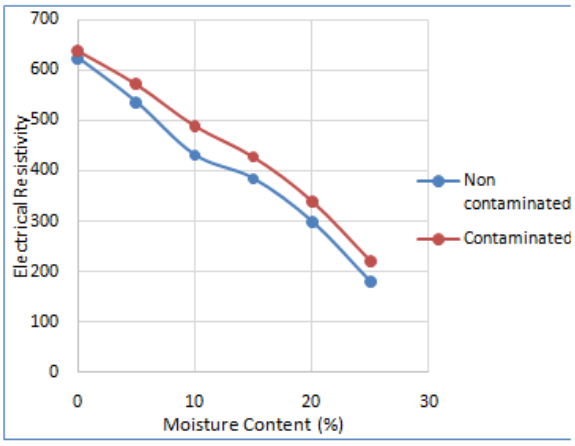

Fig5: Electrical resistivity Vs Moisture content

With increase in moisture content T\the electrical and thermal resistivity decreases. This indicates that the relationship between electrical and thermal conductivity is positively correlated. In comparing with non contaminated soil for contaminated soil the thermal resistivity increases and the electrical resistivity decreases. Figure 4 and 5 clearly shows this.

CONCLUSION

The multifunctional instrument developed to predict the change in behavior of soil thermal and electrical properties and also change in moisture content, showed change in thermal resistivity and electrical resistivity, and slight change in moisture content after the affect he heavy metal in sounding soil. The laboratory multifunction instrument can be used very efficiently for estimating thermal resistivity, electrical resistivity and moisture content of soil. The electrical resistivity and thermal resistivity decreases as moisture content increases. When soil becomes contaminated there will be a decrease in electrical conductivity value and also an increase in thermal resistivity values.

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COMPARISON OF ANALYSIS OF CONVENTIONAL AND GFRG CONSTRUCTION TECHNIQUES

Anjali Baby[1], Ann Maria Assissi [2], Aromal K S [3], Nihala [4]
[1]Assistant Professor, Department of Civil Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala
[2,3,4]UG Student, Department of Civil Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala

Abstract – Modular construction technique has played an important role in producing construction elements quickly and effectively. The modules are produced in a factory and are then transported to the construction site being prepared and then assembled. The modular construction of the houses is an innovation that has potential to tackle issues related to environmental and sustainability concerns at a rapid rate, mechanizes the construction process, enabling the mass manufacture of affordable houses in a short time period. Modular construction is widely used for single and double story as well as multi story residential buildings. This study aims to introduce and to provide more knowledge about modular houses to educate the market and to address the concern of every sector of the society especially the depressed areas of the society for beautiful, stable and affordable shelter.

Keywords—modular construction, modules, innovation, sustainability, affordable.

Introduction

Interest in offsite modular construction is growing. The reduced availability of skilled construction labor and the increasing cost of material is causing contractor's to explore modern methods of construction. One such construction is “modular construction". Modular construction is a form of offsite construction in which a building components or modules are constructed in a factory setting before being transported to site for assembly. Modular construction is already revolutionizing the construction sector. Constructions occur indoor in a factory environment, with the factory creating one or more modules, depending on the size

Abstract – The sudden increase in population has increased construction activities. And in the present scenario, the construction activities take place in those lands which are of low quality. There are many methods are practiced to increase the performance of soil. Here one of the techniques that are used to improve the performance of low-quality soilisdiscussed.Geosynthetic Reinforcement is one such technique that helps in increasing the soil bearing capacity and helps in the reduction of settlement that is caused by various reasons. Prestressed Geosynthetic Reinforcement is one such technique that helps in increasing the soil bearing capacity and helps in the reduction of settlement that is caused by various reasons. The application of Prestressed Geosynthetic reinforcement results in an improvement in the performance of footing such as circular footing, square footing on various soils such as sandy soil, expansive soil.

Key words - Prestressed Geosynthetic Reinforcement, Bearing capacity, Settlement.

Of the building. The size of the modules is generally limited by ease of transport. Once modules are finished, they can be shipped to the location where the modular building will be installed. The site can be prepared with a temporary or permanent foundation, depending on how the building will be used and the building can be locked onto the foundation and to other modules to make it ready for use. A modular building may be temporary, semi-permanent, or permanent in nature. One of the big advantages to modular construction is that it is very rapid, and it tends to be less expensive than a site-built structure. Modular buildings are also known as manufactured or prefab structures.

Modular construction, offers features like increased environmental friendliness during the construction process, and finished structures which are specifically designed to be more energy efficient. Modular buildings have a variety of uses. They may be used for long-term, temporary or permanent facilities .Modular buildings are very affordable because of the factory construction of these buildings. They are cost effective compared to conventional construction. These units are typically constructed in an enclosed facility; therefore weather is not a factor in the construction timeline. Material delivery fees are also out of the equation because an ample amount of material will always be available at the facility, as opposed to being delivered in limited quantities to the job site, nearly eliminating construction delays. Constructed is done in less time than it takes to build a home "on-site. Manufacturers cite the following reasons for the typically lower cost/price of these dwellings:

• Speed of Construction/Faster Return on Investment: Modular construction allows for the building and the site work to be completed simultaneously, reducing the overall completion schedule by as much as 50%.

• Indoor Construction: Assembly is independent of weather, which increases work efficiency and avoids damaged building material.

• Low Waste: With the same plans being constantly built, the manufacturer has records of exactly what quantities of materials are needed for a given job.

• Environmentally Friendly Construction Process: Modular construction reduces waste and site disturbance compared to site-built structures.

•Flexibility: Conventional buildings can be difficult to extend, however with a modular building you can simply add sections, or even entire floors.

OBJECTIVES

The main objective of this paper is to investigate on the current level of use of modular construction in the building sector of the construction industries, examine the advantages and disadvantages of modular construction on conventional construction, and formulate the construction techniques used.

•Further analyze the two types of construction with the help of software called Etabs.

SCOPE OF STUDY

This project is conducted to find out the alternative method for normal construction. Alternative is adopted in such a way that the cost should decrease, environmental friendly, less usage of materials, waste management technique and cost effectiveness.

MATERIALS

A. GFRG (Glass Fiber Reinforced Gypsum)

GFRG consist of high resistant glass fibers bonded with high density gypsum cement to produce panels that traditionally done with plaster casting. It is lighter in weight, superior in strength and much easier to install. Fig. 1 shows the GFRG panel used for study. It was collected from a site from Thrissur. Dimension of panel is 12*0.125*3m.

Fig.1 GFRG panel

V. METHODOLOGY

Purpose of the study was to determine the better material for construction. For this, analysis, design and estimation of both the techniques were carried out. For that plan was drawn for both techniques with the AutoCAD software. Analysis and design were carried out in ETABS software. Axial force, Shear force, bending moment diagrams was determined. Reinforcement required and footing required was also founded.

A. Making of plan after selecting a plot in Madakkathara, Thrissur, and plan for the site was drawn considering requirements and standards. Plan of a G+3structure was drawn

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by using AutoCAD software with a total area of 469.304 m^2. Dimension of ground, first and second floor is 14.3 *8.65 m. Third floor has a dimension of 10.3 *8.65 m. Then beam, column and slab were drawn for the plan. Beam has a size of 230*350 mm and a secondary beam of 230*300 mm. Column has a dimension of 300*300 mm for rectangular and 300 mm for circular. Wall thickness of normal construction building is 240 mm and for GFRG construction is 125 mm Fig. 2 and 3 shows the plan view of normal construction and GFRG panel construction respectively.

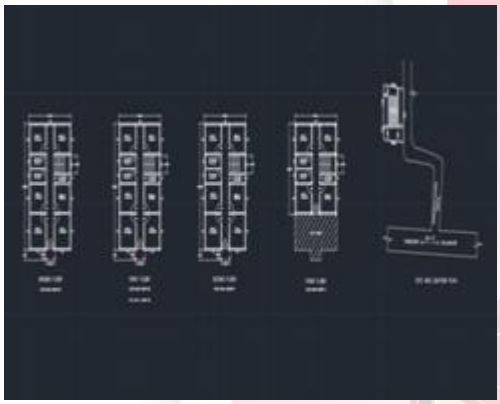

Fig. 2 Plan for normal construction technique.

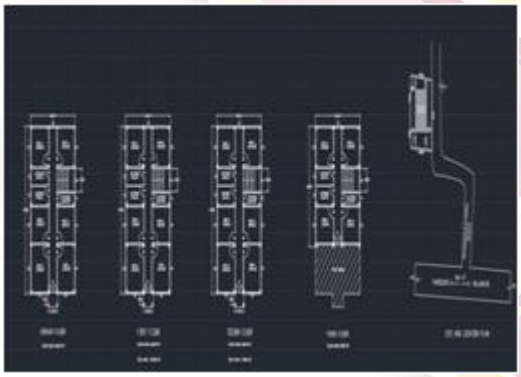

Fig. 3 Plan for GFRG construction technique.

B. Analysis and design

The plan so selected is then taken for the analysis and design. Line diagram was drawn and the material description and loading conditions were given. Loading conditions such as dead load and live load was added to the structure. After running the program, axial force diagram, shear force diagram, Bending moment diagram was found out for analysis comparison. Design for reinforcement required and footing was also found out. Fig. 4 and 5 shows the beam, column, slab diagram of conventional and GFRG method respectively.

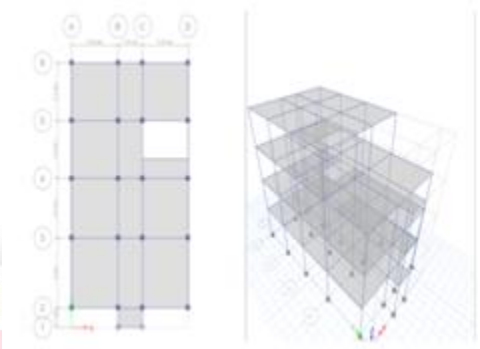

Fig.4 Beam, Column, Slab diagram of Conventional construction

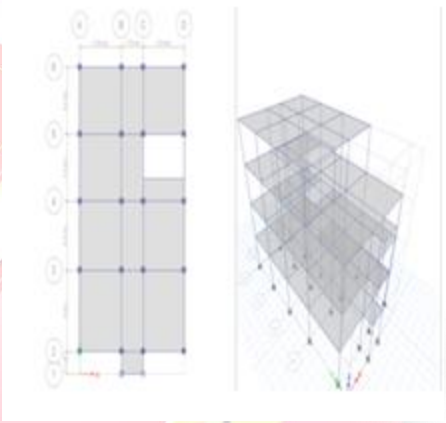

Fig.5 Beam, Column, Slab diagram of GFRG construction

VI. ANALYTICAL RESULTS AND DISCUSSIONS

A. Axial force

Fig. 6 and 7 shows the axial force diagram of conventional and GFRG techniques respectively.

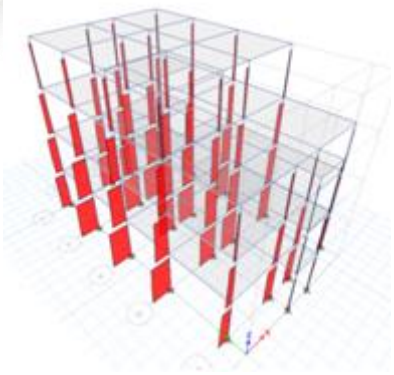

Fig.6 Axial force diagram of Conventional construction.

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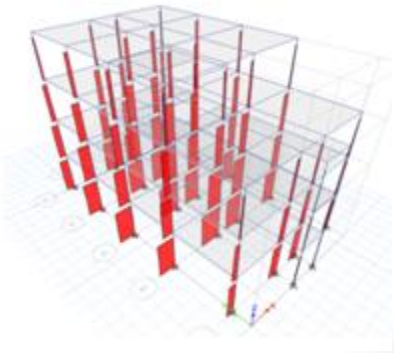

Fig.7 Axial force diagram of GFRG construction

After checking deformation, GFRG technique has shown lesser deformation compared to Conventional construction. So, strength is more for GFRG panels.

B. Shear force diagram

Fig.8 and 9 shows the sheer force diagram of conventional and GFRG construction respectively.

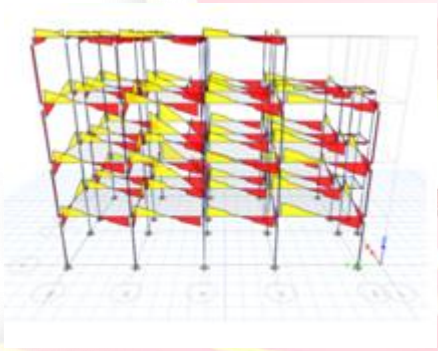

Fig.8 Shear force diagram of Conventional construction.

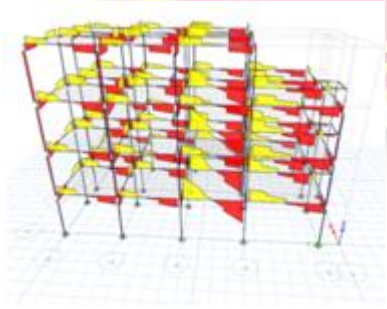

Fig.9Shear force diagram of GFRG construction.

From this we know that Shear force is greater for GFRG panels. So, GFRG has more resistance to Shear force.

C.Bending moment diagram

Fig.10 and 11 shows the Bending moment diagram of Conventional and GFRG technique.

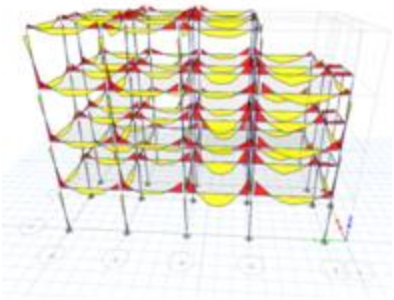

Fig.10 bending moment diagram of Conventional method.

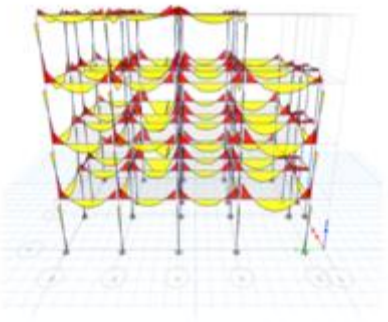

Fig.11 Bending moment diagram of GFRG method.

From this figures we are clear that there is a slight deviation in the Bending moment diagram of GFRG with Conventional method.

D.Design of Reinforcement

Fig. 12 and 13 shows the section of reinforcement required for the Conventional and GFRG technique.

Fig.12 Section of Reinforcement required for the Conventional technique.

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Fig.13 Section of Reinforcement required for the GFRG technique

E.Design of footing

Fig. 14 and 15 shows the section of Design of footing required for Conventional and GFRG method.

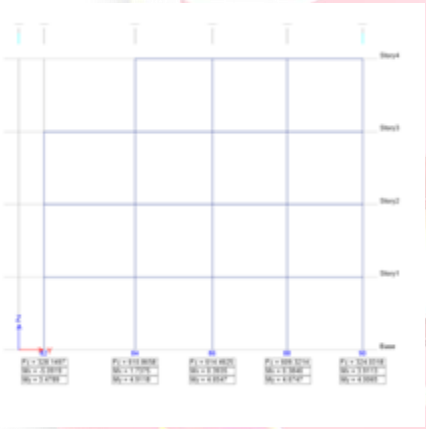

Fig. 14 Section of footing required for Design of Conventional method.

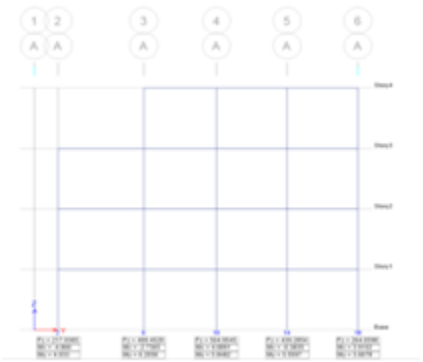

Fig.

15 Section of footing required for Design of GFRG method.

VII. CONCLUSIONS

GFRG Construction technique uses prefabricated modules which are constructed off-site, under controlled plant conditions complying with all the standards and designing to the same codes as conventionally built buildings. These types of buildings make use of sustainably sourced timbers, well insulated doors, windows and other recycled materials. Also, this construction method generates a lot less waste than conventional construction methods since the modules are built in a controlled environment in factories. There is also no risk of having materials damaged by moisture penetration.

GFRG Structures is much cost effective and also the time saving properties of this construction method are need of the hour under the increasing demand of houses. From different literature reviews and case studies, it is noted that GFRG structures are less costly than conventional buildings. It is also important to note that the money saved due to early completion of the work and the gains in form of early selling or rent from the customers of the duration saved in construction time and increased carpet area further increases the benefits of GFRG construction.

From the analyses, it can be noted that there is no compromise in strength, safety or durability of the building. The panels also have good life span compared to conventional materials which also helps us save the environment by reducing our carbon foot prints.

The limitations are that the modular shipment to the project site will have a greater cost and the accessibility to site should be carefully considered.

Comparing the analysis, design and cost of both conventional and GFRG construction methods, GFRG construction technique can be highlighted as a better alternative for conventional construction methods.

ACKNOWLEDGMENT

We wish to record our indebtedness and thankfulness to all those who helped us to prepare this report titled “COMPARISON OF ANALYSIS OF CONVENTIONAL AND GFRG CONSTRUCTION TECHNIQUES” and present it in a satisfactory way.

First and foremost we thank God Almighty for His providence and for being the guiding light throughout the project.

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Decoding the Palarivattam Flyover Fiasco

Gayathri M[1], Ashly Joseph[2]

[1,2]Assistant Professor, Department of Civil Engineering, IES College of Engineering, Chittilapilly, Thrissur, Kerala

Abstract – Palarivattom Flyover is considered as one of the most notorious scams in the public work department's history of Kerala. The scam exposed the alleged nexus between politicians, bureaucracy and contractors. Palarivattom flyover is a shoddily built infrastructure at the Pipeline Junction in the National Highway 66 Bypass in Kochi. The flyover was later shut down in May 2019, just three years after its commissioning, following the development of cracks on the structure. The cracks on pier caps of 1st, 2nd, 3rd, 7th, 10th and 12th pillars of the flyover were reported. Subsequently, the state government entrusted a specialist team from IIT Madras to study about the structural stability of the flyover. The state government also appointed E. Shreedharan, the Metro engineer to investigate the flyover. Both the committee's reported the weak stability of the flyover. The state of the flyover was so bad that renovation of the structure was insufficient and therefore it had to be demolished and then rebuild.

INTRODUCTION

In the past few years, the city of Kochi has seen a heavy rush on roads leading to Palarivattom and Kakkanad. The NH-66 (old NH-47) bypass crosses one of the busiest city roads - from Palarivattom to Kakkanad - and is also nearby the busy Edapally junction, which is the meeting point of NH-17 and NH-66 (old NH-47). The heavy traffic faced, made a flyover the need of the hour. The foundation stone for the project was laid in June 2014 and construction work commenced in September 2014. The Roads and Bridges Development Corporation of Kerala (RBDCK) was the implementing agency and entered an agreement with RDS Project to complete the work within 24 months. The firm quoted Rs 41.28 crore and bagged the contract.

The Palarivattom flyover was built during the second Oommen Chandy ministry (2011–16). Indian Union Muslim League leader V K Ebrahim Kunju was the then PWD minister. The 750-metre flyover was supposed to last over 100 years. The total construction cost of the flyover was Rs 47 crore. The cost will rise to Rs 79 crore, if the cost of land acquisition is included. Separate probes by the Vigilance and the IIT Madras teams found that the contractor had not used sufficient construction materials in the building of the flyover. Vigilance officials have hinted at a conspiracy behind the release of mobilization advance to the contractor by the PWD department. According to the vigilance and anti-corruption bureau (VACB), the RBDCK officials released an advance amount of Rs 8.25 crore to the builder in violation of norms. It is alleged that the officials did this as per the recommendation of then PWD minister V K Ebrahim Kunju. the third and the fourth accused in the case, Benny Paul and TO Soorej respectively are charged for abusing their official positions as public servants and thereby providing advantage to Sumeet Goyal (accused number one) and incurring loss to the state government. The remand report submitted by the investigation officer on August 30, 2019, also states that ‘there is every reason to believe that all the accused persons gained undue pecuniary advantage in the work of the flyover which is a sub-standard one.[2] The new Palarivattom flyover finally opened to traffic in October 2016 to decongest the Palarivattom NH bypass junction where the bypass intersects the busy Ernakulam- Kakkanad-Muvattupuzha state highway. What´s more, it is one of the longest overbridges constructed in the state and the first such structure in Kerala to be supported by single piers; 122 girders were placed using heavy-duty cranes. Civil specs The total length of the flyover is 632 m at a width of 17 m. There are a total of 19 spans in the flyover and the

bridge´s pre-stressed central and end span girders are 35-m-long. Thirty-seven posts with LED lights are installed in the bridge. Palarivattom flyover, in Ernakulam district, constructed at a cost of about Rs 48 crore was shut down as cracks appeared on the structure within two years after it was thrown open for public. The 750 metre long Palarivattom flyover, one of the longest of its kind, which was meant to ease the traffic in Kochi, Kerala.[4]

Fig 1: A file photo of the Palarivattom flyover while it was being constructed in 2016

DESIGN SPECIFICATIONS AND TECHNOLOGIES USED IN CONSTRUCTION

One of the longest over bridges constructed in Kerala, the Palarivattom four-lane flyover is the first structure in the state to be supported by single piers. The total span of the flyover is divided mainly into three sections: (1) First trestle portion with 9 spans of each of 22.20m (2) Middle obligatory span of 35m (3) Second trestle portion with 8 spans each of 21.50m A minimum vertical clearance of 6.00m is allotted for the obligatory span. Flyover has been designed as bidirectional (each two lane) with a design speed of 85kmph. Cast-in-situ RC girder and deck slab of grade M35 concrete is being used for the standard spans (the two trestle portions), whereas cast-in-situ prestressed concrete post tensioned girders and deck slab of grade M40 is being used for the obligatory span. Grade of concrete used for the sub structural components like pier, pier cap, and piles is M35. All the necessary reinforcement is provided using Fe500 confirming to IS: 1786. A solid ramp portion with slope of 1in 30 is provided on either side of the flyover. An initial valley curve (100.00m), followed by a 1 in 30 slope (116.40m), a summit curve (280.00m), another 1 in 30 slopes (135.441m), another valley curve (100.00m), and a 1 in 150.37m slope together comprises the entire section of flyover. Elastomeric bearings separate the superstructure from substructure. RDS company while constructing claimed that "The entire piling work has been undertaken using a hydraulic MAIT drilling machine as against the conventional tripod rig type piling. This has helped speed up the completion of piling works in the shortest time. Further, cities like Kochi now have several concrete batching plants, where quality assurance is completely ensured. They have made use of the best batching plants near the site, as a result of which, concrete was delivered on time without any delays owing to traffic snarls. We have used only boom placers and concrete pumps for concreting, which has largely helped in pumping concrete amid heavy traffic. The structure has made use of M30 grade of concrete for its foundation, M35 for the sub structure and M40 for the super structure, which ensured consistency in quality and strength. Besides, aggregate and sand were sourced locally. The challenge Space restriction and heavy traffic were the two major concerns. To address this, Kumar said, ´Leaving the required space for smooth traffic, we meticulously planned the concreting and erection of girders in a way that the process until the erection of the structure was smooth. So also, 1 mm GI corrugated deck sheets were used for the central span, avoiding shutter supports and allowing traffic while concreting. Also, most RCC girders were cast right below the respective span to avoid long shifting. For the 35-m spans, PSC girders were cast all along the side of the flyover, necessitating shifting. For this, the project made use of hydraulic trailers with turn buckles, so that the girders were properly secured while shifting. Another advantage is that such trailers can be placed in the exact position because of hydraulic steering, which makes erecting the structure easy besides, heavy-duty cranes of 135 m and 85 m were used, and heavy supporting columns were erected with cribs to support the girders. Girders could be erected only during night hours.

Project Details are:

- Height: 6 m
- Completion: October 2016
- Construction cost: Rs.42 crore
- Design consultant: Nagesh Consultants, Bengaluru.

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- Website: www.nageshconsultants.com
- Project consultant: Kerala Industrial & Technical Consultancy, Kochi (KITCO)...
- Construction contractor:
- RDS Project, Kochi, Kerala.
- Website: www.rdsproject.com
- Contracting agency: Roads and Bridges Development Corporation, Kochi.
- Website: www.rbdck.com

Civil Specifications are:

- Spans: (AP1 to P9 = 9 nos) + (P9 to P10= 1 no) + (P10 to P18 = 8 nos) + (P18 to AP2 = 1) = 9 x 22.2 m + 1 x 35 m + 8 x 21.5 m + 1 x 35 m = 441.8 m
- Approaches: 2 x 110 m = 220 m
- Total length: 661.8 m
- Foundations: 1000 mm dia piles = (17 x 4) + (3 x 6) = 86 nos..
- Pile Cap = (17 x (4,300 x 4,300 x 1,500) + (3 x (7,300 x 4,300 x 1,800)
- Sub structure: Pier = 20 (1,800 x 1,800)
- Pier cap = 20 (7,400 x 2,200 x 1,500 / 1,000)
- Super structure: 9 spans x 6 RCC girders each of 20.5 m + 8 spans x 6 RCC girders each of 19.55 m + 2 spans x 10 each PSC girders each of 32.8 m
- Deck slab
- Miscellaneous:
- RCC crash barrier: At Edges and median
- Expansion joints; strip seal type expansion joint every III span and both ends of PSC girders; rest of the span joints provided with deck continuity
- Bearings: All RCC spans four no. elastomeric bearings and both 35 m PSC girder spans with four no.POT bearings

DETECTION OF DAMAGES

The flyover, built by Roads and Bridges Development Corporation of Kerala Limited (RBDCK) and commissioned in 2016, was closed to traffic in May 2019 after over 2,000 cracks, small and big, were detected on its girders and pier caps. Triggering panic among the motorists, six major distress cracks have been detected on the newly constructed Palarivattom flyover. The recorded shear cracks are propagating and widening. Additionally, new shear cracks have been recorded in the girders," the report said. The report also pointed out the shear cracks were previously noted in the pier cap of obligatory span (pier no. 10) and pier cap of piper no. 12. However, during the ongoing cycle, additional distress shear cracks were recorded in pier no. 1, 2, 3 and 7 in the shear zone. The shear cracks are 0.2 to 0.3 mm in width and propagating diagonally in the shear zone of the pier," the report said. The flyover thrown open to the public in the last leg of 2016. The 750-metre-long flyover, one of the longest of its kind in the state, was constructed by the Roads and Bridges Corporation of Kerala after spending nearly `39 crore to ease the traffic congestion at the busy Pipeline junction along the National Highway stretch. The report also warned the NHAI to stop plying vehicles in the stretch. "It's evident that distress in the bridge is progressing and suggested remedial measures have to be expedited for urgent rehabilitation of the bridge. It is recommended that till complete rehabilitation work is carried out, vehicle must be stopped from plying on the bridge with immediate effect for public safety and safety of the structure," the report added. Meanwhile, the RBDCK which constructed the bridge admitted cracks have been detected on the pier. "We have entrusted IIT-Madras to carry out a study on structural evaluation. Based on their report, we will take the next step. We are taking all the efforts to solve the crisis," an RBDCK officer said. [3] Cracks were detected on the pier cap of the 1st, 2nd, 3rd, 7th, 10th and 12th pillar of the flyover. This was revealed in a report released by a private bridge inspection agency the other day after it carried out a survey on the safety of the bridge.

According to the report, the distress in the bridge has magnified. Tests were conducted to analyse the strength of the concrete at the Kerala Highway Research Institute's laboratory. It verified that 'out of the samples taken from six girders of the flyover, only samples of two girders met the required concrete strength. Samples taken from two pier caps and piers also failed to meet the expected concrete strength," it stated. "The condition of the flyover is so poor that it can endanger life and property of public," the investigation officer stated in the report. A team from the IIT Madras had examined the condition of the structure and submitted an interim report

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detailing the magnitudes of large cracks and potholes that appeared in it. The team led by P. Alagusundara Moorthy, Professor of Structural Engineering Laboratory, Department of Civil Engineering in IIT-M found that the major errors during the construction resulted in formation of cracks within girders and pillar caps of the flyover. The team also observed that the cracks over girders and pillar caps were caused due to inadequate usage of cement and steel, which is indirectly pointing towards the largescale corruption at the time of its construction. The team had suggested that the rectification could be done using Carbon Fibre Reinforced Polymer (CFRP) method, also known as Carbon Fibre Wrappings. The team has even supervised the first set of repair and rehabilitation works of the structure. The slack supervision by both the agencies, coupled with unscrupulous practices like inadequate usage of cement and steel, which reek of corruption led to the flyover developing cracks as well," he said. He also pointed out the negligence of Kitco for not giving due care to the design and other critical parameters of the flyover which was readied by New Delhi-based contracting firm RDS Projects. Earlier, in September last year, the cracks on pier caps of various pillars of the flyover had been detected by a private bridge inspection agency. "The recorded shear cracks are propagating and widening. Additionally, new shear cracks have been recorded in the girders," the report had said.[1]

THE VIGILANCE REPORT

Soon after the flyover was closed raising the security concerns, the Vigilance and Anti-Corruption Bureau (VACB) started to probe into the construction of the flyover. A case has also been registered against the RBDCK and concerned contractor under section 13 (1)(d), section 13(2) of Prevention of Corruption Act 1988 and Section 120 (B)(d) of the Indian Penal Code. The vigilance bureau on early June submitted a report on the condition of the flyover to the Muvattupuzha Vigilance Court. The report revealed that the structure is in a dangerous condition and poses a threat to the life of people and properties which cannot be solved with maintenance. Demanding a probe against Road and Bridges Managing Director Muhammed Haneesh and seventeen other officers related to Palarivatton Bridge scam, the report also asks to obtain the money that needed for the construction, from the company.[1]

FACTS REVEALED AFTER INVESTIGATION

According to the remand report accessed by TNM, about 29 witnesses were questioned in the course of the investigation. The investigating officials had also conducted a separate quality check on the construction of the flyover. Indian Insititute of Technology (IIT) Madras, which was entrusted with the duty to inspect the condition of the bridge, has submitted a report to the state government recently and according to Chief Minister Pinnarayi Vijayan, the report raises uncertainty over the lifespan of the bridge if it is renovated. The investigating team of Vigilance had also conducted a separate quality check on the construction of the flyover. Tests were conducted to analyse the strength of the concrete at the Kerala Highway Research Institute's laboratory. It verified that 'out of the samples taken from six girders of the flyover, only samples of two girders met the required concrete strength. Samples taken from two pier caps and piers also failed to meet the expected concrete strength[4]

Fig 2: Cracks found in the pavement surface

Fig 3: Spalling of concrete

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The remand report also specifically mentions the role of each of the accused in the scam. According to the report, the first accused and contractor Sumeet Goyal misappropriated the 'mobilization advance' fund amount of Rs 8.25 crore to meet personal financial crisis and then later compromised on the quality of the construction. The misappropriation of the allotted advance amount was carried out after conspiring with the other accused alleges the report. Mobilization advance is payment made to the contractor by the client for initial expenditure of the project. It basically reduces a contractor's need to take working capital from his own pockets.Meanwhile the second accused MT Thankachan, former assistant general manager (RBDCK), is reported to have 'helped the contractor by intentionally selecting his bid even though it lacked sufficient documents to prove criteria of the contractor'. The report also states that the accused did not inform other bidders that there was a mobilization advance. While RBDCK was directly in charge of the project, KITCO was the consultant of the flyover construction. As per rules, the technical report prepared by RBDCK should be evaluated by KITCO to prepare a Detailed Project Report (DPR) of the project. Despite the technical report prepared by RBDCK lacking certain necessary documents, the third accused Benny Paul, joint general manager of KITCO, did not reject the proposal, alleges vigilance. Instead, Benny recommended RBDCK for the construction of the flyover. Benny Paul was the head of the wing which supervised the construction of the flyover. He has also been accused of not properly monitoring the work. "His intentional lack of proper supervision helped the contractor to save money for himself instead of spending it on the construction of flyover," the report states. The VACB report also clearly mentions that there has been a criminal conspiracy between MT Thankachan, Benny Paul and Sumeet Goyal. TO Soorej, the fourth accused in the case, held two important positions during the implementation of the project. Apart from being the secretary of PWD, he was also the member secretary of Kerala Road Fund Board (KRFB) which was the funding agency of the project. According to the agreement of the project, 30 percent of the 'running bill' – issued by contractor on completion of part of the work – can be deducted as recovery of mobilization advance given during the beginning of the project. But as per the VACB report, Soorej wrote a direction to KRFB stating to deduct only 10 percent of running bill from the contractor. This, VACB says has caused a 'huge loss to the public exchequer'

Sumeet Goyal, managing director of RDS Projects Ltd, the construction company; MT Thankachan, former assistant general manager of Roads and Bridges Development Corporation of Kerala Ltd. (RBDCK), a subsidiary of Kerala PWD; Benny Paul, joint general manager of KITCO which provided technical expertise, are others who have been remanded by the Muvattupuzha sub jail by the court.

Expert examinations by a team from Indian Institute of Technology, Chennai had even found that the flyover has major structural problems other than problems in its construction. Following this, the flyover was shut down for traffic on May 1. Simultaneously, the Vigilance and Anti-Corruption Bureau (VACB) started its probe. The third and the fourth accused in the case, Benny Paul and TO Soorej are charged for abusing their official positions as public servants and thereby providing advantage to Sumeet Goyal (accused number one) and incurring loss to the state government. The remand report submitted by the investigation officer on August 30, also states that 'there is every reason to believe that all the accused persons gained undue pecuniary advantage in the work of the flyover which is a sub-standard one'. Kochi city, already choked by traffic jams has been badly affected with the closure of the flyover. The flyover's construction which began in 2014 while Congress led UDF was in power in the state, was thrown open to public in 2016 while LDF government came to power. However, the state minister for Public Work Department, G. Sudhakaran had stated after an inspection of the damaged structure that administrative and professional lapses by officials of RBDCK and Kitco (the project's design and technical consultant), along with the apathy of the previous UDF government, led to the flyover getting damaged within months of its inauguration in October 2016. This also caused dozens of accidents, mainly involving two-wheelers.[2]

THE RECONSTRUCTION

Kerala Government on Monday announced its decision to rebuild the Palarivattom flyover on the National Highways 66

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(NH66) in Kochi. The flyover, inaugurated in October 2016, was shut in May this year after major flaws were detected. The temporary closure for one month was since extended indefinitely. The decision to rebuild the flyover was based on an expert committee report which suggested that rebuilding is better than renovating or strengthening the bridge.E.Sreedharan, the 'metroman', who was appointed as the consultant to assess the condition of the bridge has also made similar recommendations."E Sreedharan has also said that renovation or strengthening is not a feasible option. We have accepted this recommendation and hence decided to rebuild the bridge," Kerala CM Pinarayi Vijayan said at a press conference in Kochi. "The existing structure will be demolished. E Sreedharan has been given the charge of overall supervision of the project. The design and estimates will be submitted by Sreedharan in a few days," Pinarayi Vijayan added. Construction of the Palarivattom Bridge began during the tenure of the previous government but the flyover was opened for the public shortly after the left government took charge in June 2016.

Fig 4: E.Sreedharan inspecting the flyover

E Sreedharan- the principal advisor of Delhi metro who was also instrumental to the implementation of Kochi metro, inspected the flyover following the direction from Chief Minister Pinarayi Vijayan. Sreedharan has been asked to submit a report and the government would take the final call on whether the flyover needs to rebuilt or not as per the report. Further work will be decided after considering the final report of IIT Madras, Sreedharan said after visiting the damaged structure. Though rebuilding the structure would cause huge financial liabilities, the structure cannot exist in the present form, he said in a meeting of experts. The traffic over the flyover was initially banned for a 30-day period till May end for replacing the deck-continuity expansion joints, but has been extended since then. The second phase of the rehabilitation work will be carried out for a three-month period after the monsoon, from September. The decision to rebuild the flyover has been taken following a report by experts from IIT Madras. The report had observed that the condition of the over bridge was so bad that rebuilding was the only option. A decision in this regard was taken during a high-level committee meeting convened by chief minister Pinarayi Vijayan on Monday. "The government has decided to go for rebuilding as the experts suggested that rebuilding will be more cost effective than re-strengthening as the structure is in such a bad state," the chief minister said. According to the CM, an expert committee will be assigned to prepare the design of the bridge. Metro man E. Sreedharan has agreed to the government's request to take up the responsibility of supervision. The work will start next month and will be completed by October, 2020.Built with a budget of Rs 48 crore, the flyover was shut earlier this year as major cracks were found, within two years after it was inaugurated. The work on the flyover had started in 2014 and it was open to the public in 2016. Earlier, an expert committee headed by Sreedharan had also submitted a report that noted that any kind of repairing work or other means cannot solve the defects of the bridge. "The government was waiting for the report from IIT experts to take a final call," Vijayan said[4] The work to dismantle and rebuild the pier caps, girders and slabs of the flyover began on September 28, with a nine-month deadline (June 2021). The DMRC awarded the work to Kozhikode-based ULCCS. Every effort was being made to complete the structure in six months, the sources said. The work to strengthen the piers using concrete wrapping was done along with the dismantling and rebuilding work. The ongoing work by the agencies was unique in the sense that traffic disruption was minimal, since the signal junction was barricaded and vehicles through Civil Line Road were diverted through newly-readied U-turns on both sides of the bridge. One reason is that girders were cast at DMRC's yard in Kalamassery and transported to the work site. The nine-

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month reconstruction work was entrusted by the State government to DMRC in the third quarter of 2019 and work was set to begin from October 1, 2019. The year-long delay occurred after contractors and allied bodies approached the High Court, seeking conduct of a load test to determine the flyover's strength.The government decided to go ahead with the reconstruction of the crack-ridden parts of the structure, after the Supreme Court permitted it a week ago to go by the decision of expert committees which had been set up to probe the flyover's structural strength. The committees, including the one headed by Metroman E. Sreedharan, had recommended reconstruction of the structure, with the pillars remaining intact. The current girders – horizontal beams that support a structure – would then be the first to go. New pre-stressed concrete girders will take its place. A total of 100 girders demolished. The pillars, which suffers the least damage left as they were. Defects were also been found in the spans, girders and pier caps in the middle of the bridge. These completely replaced. The decision was taken after discussions between the Uralungal Labour Contract Co-operative Society Ltd and the Delhi Metro Rail Corporation (DMRC) Earlier, studies revealed that there were 2,100 cracks in the structure. Of them, 99 are high-risk ones.A total of 100 girders demolished. The pillars, which suffers the least damage left as they were. It is estimated that the entire cost of the work (both demolition and reconstruction) amount toRs 18.71 crore. Of this, Rs 15 crore had spent on the construction of new spans while Rs 2 crore was for demolition and Rs 1.71 crore for jacketing.Traffic on both sides of the bridge not restricted, but vehicles not allowed to pass through the pipeline-Palarivattom route. The flyover, considered a boon to the severe traffic snarls faced at Palarivattom, closed within a year of its inauguration after cracks developed.[2]

Fig 5: DMRC begins work to reconstruct Palarivattom flyover

A pooja was conducted prior to beginning the work. Sources in UralungalLabour Contract Cooperative Society (ULCCS), to which DMRC entrusted the work, said that the entire tarred surface of the four-lane structure located on the Edappally-Aroor NH bypass would be scooped out in three days. The material will be taken to DMRC's concrete pre-casting yard at Muttom, for possible reuse. This was followed by work to cut the concrete structure into pieces, using diamond cutters. The cut pieces brought down using crane and crushed beneath the flyover, while taking care to prevent dust from affecting motorists and others passing through the junction[1]

Fig 6: Demolishing works

Simultaneously, steel extracted from the concrete, as was done with the debris of apartments that were demolished at Maradu, for recycling. The crushed concrete material too would most likely be taken to the yard, they added. The proposal to slice the concrete into specific shapes for being used as sea wall in Chellanam and other coastal areas severely affected by raging seas, has been dropped. Sources in DMRC reiterated that the impending reconstruction-cum-reinforcement work would ensure that the flyover had a 100-year life span. This is in contrast with less than 20-years life, if it were to be strengthened through carbon-fibre wrapping.[4]

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Fig 7: Flyover after reconstruction

CONCLUSION

Palarivattom is one of the busiest and the most important junctions in Kochi. For decades, crossing this junction through the national highway bypass was a painstaking effort for the commuters. The Palarivattom flyover, in Ernakulam district, which constructed to solve traffic issues of the city, at a cost of about Rs 48 crore was shut down as cracks appeared on the structure within two years after it was thrown open for public. This is purely because of corruption and greed of officers. The reconstruction of the bridge caused loss of public money as well as valuable time of the general public. Let us hope that the fiasco serve as a model example case for those entrusted with the accountability and responsibility of overseeing the construction and maintenance of public infrastructure so that any untoward act of corruption and blatant use of power causing loss to the exchequer in future are strictly kept at bay.

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Coconut Tree Climber Bike

Subeesh P S[1], Vishnu P[2], Vishnu Sathyan[3], Athul Uday[4], Mohammed Said U Y[5]

[1, 2, 3, 4]UG Student, Department of Mechanical Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala
[5]Assistant Professor, Department of Mechanical Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala

Abstract – Coconut tree climber bike is a machine is used to help our coconut farmers for cutting coconut from trees. Agriculture is one of the major sectors of Indian economy. Especially in the rainy season, the coconut tree attacked by the fungus at the tree top. Tree climbing is risky job during monsoon. Hence an attempt is made to design and fabricate unit that serves this purpose. Parts are, Supporting Rod, 2 rollers, 52 cc petrol brush cutter as an engine, controlled by accelerator and braking system using disc brake and ratchet mechanism. It contains 2 rollers. It mounted on the slot of supporting beam. The upper rollers are freely rotated and the down roller is drive by engine. Fist we fixed the machine according to the picture. Then we start the engine which is mounted to the roller and the machine climbs up. The up and down movement of machine is controlled manually by accelerator and brakes.

INTRODUCTION

In recent years, non- availability of labors has emerged as one of the biggest challenges in farming. One crop that has been most affected by this is the areca nut. Areca nut trees attain a height of about 60-70 feet. It is mandatory to climb the trees a minimum of seven times a year for a successful harvest. Bud-rot, Koleroga, food- rot, Ganoderma-basal stem rot, leaf blight, stem bleeding are other diseases which affect coconut yield and cause damage in varying degrees. As a result, there is reduction in the size of leaves and nuts, tapering of the stem and mature nut fall occurs. It is estimated that about 35- 40 % of coconut plantation in Kerala has been affected by these diseases. In addition to the diseases mentioned above coconut are also affected by many pests and insects like Rhinoceros beetle and Black headed caterpillar. Therefore, in order to prevent the above-mentioned problems pesticides are sprayed frequently to the coconut.

A. TRADITIONAL METHODS AND COMPARISON

In olden days' farmers used to manually climb the trees till the top. There is acute shortage of human coconut tree climbers not only in India but all over the world. Traditionally this job is taken up by the socially and economically backward people in India. As the literacy rate increases and India is growing economically, there are several high paid jobs which people move in to. It also a risky job in which an accident might be fatal in some cases. Therefore, a semiautomatic machine is developed which climbs the tree for the required height and helps to cut the coconut more easily and quickly.

B. ECONOMICS OF PRESENT-DAY HARVESTING

The cost of labor varies by how many trees they climb. For climbing a single tree it varies from Rs50 to Rs80 and Rs500-750 per person who comes to collect the fallen coconuts and put them in rags. In large areas they come in groups of 7-8 members, with one or more person climbing up the tree and couple of people to collect the fallen nuts and bag them and few more to carry the bags. This comes up to around Rs7000-9000 a day wherein they can do up to an acre. Thus, the cost of harvesting per acre is almost around Rs10000. This in turn is done 4 times a year per acre, thus making it an expensive affair. More over keeping in mind that any little accident due to slip can result in fatality of the person climbing the tree; traditional process proves to be very unsafe. And in the event of a fatality all the expenses and compensation are usually taken up by the landowner.

METHODOLOGY

The methodology used here is quite simple that everything is dependent on the equipment. The equipment parts are Supporting Rod, 2 rollers, 52 cc petrol brush cutter as an engine, controlled by accelerator and braking system using disc brake and ratchet mechanism.

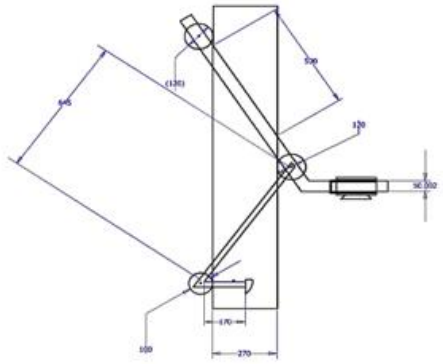

Fig -1: Machine Drawing (dimensions in mm)

The two roller wheels are mounted into the slot of 2 holes of the body frame meant for wheels shafts. The upper roller wheel is set to freely rotate and the lower roller wheel is driven by chain mechanism with a gear ratio of 1:4. 52CC engine's output shaft is connected to the lower roller wheel shaft with this chain. Lower wheel shaft consist of a ratchet and a disc brake for braking mechanism. The ratchet will help our equipment to stay firm without rolling back down when it starts to climb. The ratchet is designed in a way for one directional motion which means, it can be operated to climb easily without rolling back down and the ratchet locks each other if it has any kind of backlashes. So, the operator who is riding this need not be worried about falling down while climbing. And if the operator wants to get back the equipment down from the Coconut tree, he just has to pull the lever on the handle bar. This will dis-engages the both ratchets and let them roll down slowly while applying brakes. First of all, we fixed the machine according to the picture. Then we connected the sprocket on the driven shaft and engine using chain, when engine is started by giving throttle the machine climbs up. The downward motion of machine is controlled by Ratchet and disc brake. For the physical firm of the machine to grab around the tree, we have added a rubber wheel which will be placed under the machine. The man power on this equipment is quite little and it's easy to handle the machine and lift it, because it is light in weight. The machine will not be having backlash/roll downwards which will be dangerous. For rectifying this we have added the ratchet mechanism. So that the operators do not need to hold the disc brake all the way long while cutting down the Coconut. The machine will get grabbed to the tree without running back down, when the accelerator is reduced. The Chassis/frame is made up of Aluminum square pipe which reinforces the motor and the other components very firm and tight. We will be using electric welding to joint each frames together to get into to the right desired shape of the frame.

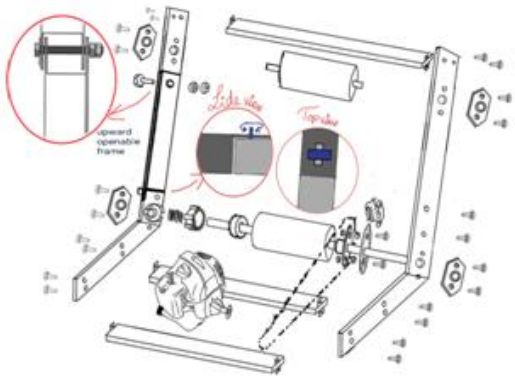

Fig -2: Assembly Drawing of Machine

SPECIFICATIONS AND FUNTIONS OF PARTS

BRUSH CUTTER ENGINE

A brush cutter is a powered garden or agricultural tool used to trim weeds, small trees, and other foliage not accessible by a lawn mower or rotary mower. Various blades or trimmer heads can be attached to the machine for specific applications. This machine enables the user to use it as a grass cutter as well as a multi-crop cutter. Here we use only the engine of the brush cutter which has 52cc 2stroke petrol engine. It provides the very essential torque for the setup to climb up and come down along the length of the tree.

Table - 1: Specifications

Type	2 Stroke
Displacement	52CC
Number Of Cylinders	1
Power	2.4HP
Brand	STALLION
Dimensions	SMALL
Dry Weight	5
Engine Oil Capacity	125
Fuel Tank Capacity	1000ML
Ignition System	RECOIL

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Fig -3: 52CC Engine

B. DISC BRAKE

The disc brake system consists of a rotor or disc fitted on the wheel and caliper with pads on either side. So, when you pull The brake lever, the oil is pushed towards the calipers and in turn; it applies pressure on the pads which creates friction with the disc to slow or stop the Tree climber bike. A Disc brake assembly contains brake rotor (Disc), Calipers, brake pad, master cylinder, brake lever or pedal and cable. The brake rotor or brake disk is the main rotating part of the disk brake assembly. It is the component by which the brake caliper clamps its hold to stop the wheel rotation. It is hard wearing and resists high temperatures that occur during braking. We are using cross drilled rotor. The drilled holes help to disperse heat which is generated while braking. The cross drills help to disperse this heat and gas. The same reason also helps in reducing brake fade under repetitive and hard braking.

Fig -4: Disc Brake

C. WHEELS

This is the part of the machine which will be in direct contact with the tree. The iron rollers are connected to the shaft and are rotated by supplying power. The machine ascends to the required height to perform the required job. By rotating the rollers on driven shaft in clockwise direction, the machine moves up. The diameter of the rollers is 11 cm and length is 22 cm. To create friction between the rollers and the tree, the rollers are covered with rubber. Generally, for gripping purpose natural rubber is used. The rubber used for rollers are made from natural rubber. The Natural Rubber is having high carbon contents which will give the rollers tight bonding nature and having the ability of high resistance to wear and tear. In this machine three driving wheels are used.

Fig -5: Wheels

FLANGED BEARING

SKF flanged ball bearing units consist of an insert bearing mounted in a housing, which can be bolted to a machine wall or frame. The SKF assortment includes units compliant with ISO standards, North American standards, or Japanese Industrial Standards (JIS). Here we are using oval flanged bearing of ufcl204, which is fixed on the frame for the rotation of shaft.

Fig -6: Oval Flanged Bearing

E. HERO KICK RATCHET

Fig -7: Kick Ratchet

F. SUPPORTING BAR AND SOLID SHAFT

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It contains a supporting bar. It is hollow bar and it hold shaft of roller and hold engine. It is made up of steel .Here we are using 3inch width and 1.5 inch thickness hollow square bars. Full body weight of the machine is supported by these hollow bars. A shaft is a rotating machine element, usually circular in cross section, which is used to transmit power from one part to another, or from a machine which produces power to a machine which absorbs power. The material used for ordinary shafts is mild steel. When high strength is required, alloy steel such as nickel, nickel-chromium or chromium-vanadium steel is used. 19mm diameter 40mm length shafts formed by hot rolling and finished to size by cold drawing or turning and grinding are used here. The hero kick ratchet is used to control the movement of the machine and also for safety stay on the top of the tree. The ratchet has 2 parts one is fixed on the frame and other will be rotating with driving shaft.

Fig -8: Supporting Bar & Solid Shaft

G. ACCELERATOR BRAKE MOUNTS AND CABLES

Brake cables are used for braking with cable-pull brakes. They consist of two parts: an inner cable of braided stainless steel wire and an outer cable housing, and work by transmitting force using a combination of tension on the inner cable and compression to the housing. An accelerator cable, sometimes called throttle cable, is a metal braided cable that serves as a mechanical link between the gas pedal and the engine's throttle plate. When the gas pedal is pressed, the cable is pulled and opens the throttle.

Fig -9: Accelerator Brake Mounts & Cables

H. CHAIN SPROCKET AND CHAIN

A sprocket, sprocket-wheel or chain wheel is a profiled wheel with teeth, or cogs, that mesh with a chain, track or other perforated or indented material. The name 'sprocket' applies generally to any wheel upon which radial projections engage a chain passing over it. Sprockets are often made from metal or reinforced plastics that can withstand the force of moving the chain. These components are often compared to gears, which share a similar wheel-shaped design with teeth. Unlike gears—which interlock together to transfer rotational movement— sprockets only directly interact with different types of chains. Rather than a gear system, most sprocket and chain systems work in a similar manner to bicycle chain assemblies—which is itself a lightweight sprocket and chain assembly.

Fig -10: Chain Sprocket & Chain

I. NUTS AND BOLTS

A nut is a type of fastener with a threaded hole. Nuts are almost always used in conjunction with a mating bolt to fasten multiple parts together. The two partners are kept together by a combination of their threads' friction, a slight stretching of the bolt, and compression of the parts to be held together. A bolt is a mechanical fastener with a threaded shaft. Bolts are closely related to screws, which are also mechanical fasteners with threaded shafts. These types of fasteners are typically inserted through two parts, with aligned holes.

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Fig -11: Nuts & Bolts

COST ESTIMATION

This is a very cheap project according to agriculture project. We can use very cheap cost material with long life. This machine is mainly manufacture for farmers. We use simple method so we can make our project with less cost. Our maximum cost is around 13000 only. The most valuable part is engine. And the least value part is supporting wheel. So the machine is affordable for all type of farmers. The cost estimation is given in the table.

Table - 2: Cost Estimation

PART	NO.OF UNITS	COST IN RS
Steel Bar and solid shaft		800
Tyre	2	500
Engine	1	5000
Ratchet	1	525
Disc brake	1	1600
Flanged bearing	4	1000
Chain and sprockets		500
Bolts and nuts ,Machining And Other Costs		2500
TOTAL		Rs 12425/-

RESULT AND ANALYSIS

This is the most suitable machine for harvest coconut. The machine can be easily attached and removed from the tree easily. After the machine has been attached, jacket is attached with the climber for more safety. The machine operates on 52cc brush cutter engine and climbs the required height very quickly. Once the machine reaches the required height it stays there and harvests the coconut easily by the climber. The machine takes very less time to reach the top of the tree and it provides more safety. By 1liter of petrol we almost climb more than 20 trees.

ADVANTAGES

This project aims at replacing conventional methods of climbing coconut trees, which are dependent on laborers, with a more cost effective and environment friendly system, dependent on fuel the machine provides more safety and very affordable to use. We can consume time by using this machine and in half an hour we can climb more than 20 trees. This is the most suitable machine for climbing on the tree and we can stay easily on the top of tree. This machine can be easily attached and removed from the tree. And we climb more trees with limited budget and no need of skilled labors also.

CONCLUSION

This coconut tree climber is quite helpful equipment for the coconut harvesters, since it has reduced the drudgery in tree climbing and improved the climbing efficiency there by providing employment opportunity for rural youths, which has helped them to improve their livelihood. The coconut growers of district were benefited very much, since there was lack of skilled labor for harvesting nuts. As it is light in weight, it won't damage the tissues of the coconut tree, and it provides safety as well as, the farmer or the operator need not to be scared about climbing or descending as it will be more like a ride which needs to pull a lever and everything is done easily. Simplicity of operating this equipment reduces tiredness in farmers/operators. Then they will be more comfortable to watch those coconut tree heads more closely and then cut down almost all fully grown in an easy way.

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STABILISATION OF CLAYEY SOIL USING PLASTIC STRIPS

Pooja Surendran[1], Zinadin Zidhan[2], Sana Abdulla[3], Ramees Ali[4], Angela Joy[5]

[1,2,3,4]UG Student, Department of Civil Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala

[5]Assistant Professor, Department of Civil Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala

Abstract –Soil stabilization is one of the best methods for improving physical properties like shear strength, bearing capacity etc. of the soil. For soil stabilization various admixture such as cement, lime, fly ash, gypsum etc. can be used. But these admixtures are costly so their use for soil stabilization is limited. In some research it is found that utilization of waste material like plastic, bamboo etc. are quite helpful in stabilization of soil. In present world there is scarcity of good soil which makes construction process difficult. So to enhance the properties of soil so that it can be used for various constructions there is need to add the suitable admixture in soil. This admixture should enhance properties of soil and also be economical. In this study plastic bottles are used as an admixture. The waste plastic bottles are cut into small strips and these strips are added in the soil in different percentage of 0%, 0.25%, 0.5% and 0.75% of dry weight of soil. Plastic waste becomes one of the major problems for the world. So the use of plastic waste for stabilization of soils and using plastic as soil stabilizer would reduce the problem of disposing plastic waste & also reduce facing environmental problems.

Keywords: Plastic Strip, Shear Strength, Stabilization

Introduction

Soil stabilization is a process in which, suitable materials such as cement, lime, fly ash, bitumen etc are added which helps in increasing the shear strength and bearing capacity of soil, which leads to the improvement of the properties of soil. It controls the shrink as well as swell properties, increases shear and bearing strength of soil, Plastic is a renewable and non bio-degradable material. The disposal of waste plastic bottles causes environmental pollution. Plastic can be recycled or Reused i.e. reprocessing these plastic wastes and make some useful products. Waste of plastics can be used as admixture for stabilized soil. Waste plastic materials can be reused because it can be recycled many times thus reducing the wastage. Use of the plastic waste for the enhancement of the properties of soil, is an effective and economical way of stabilization. Uses of materials made of plastic are increasing day by day, but the disposal of plastic increasing the waste plastic content in municipal waste. As technology is improving in the society day by day, a new technique of soil stabilization is found in which waste quantities such as plastic, bamboo, polythene bags, bottles etc, are effectively utilized for enhancing the soil properties. As these waste materials are increasing in society day by day which leads to different natural problems, hence the use of waste plastic materials as an admixture should be imply which increases the strength of the soil , reduces the cost of admixtures and leads to economical use of plastic without causing any environmental and ecological hazards. Stabilized soil is more durable having comparatively high strength, good quality of soil, less permeability of soil and useful for constructions of roads by reducing the thickness of pavement and also control the shrink, swell properties of soil, which helps in achieving better soil gradation. It can significantly improves the working platform for various construction operations

MATERIALS AND METHODOLOGY

MATERIALS USED

(a) SOIL

(b) Clayey soil taken from Mangalam dam in Palakkad, Kerala is used for experimental study. As per I.S.

Classification (IS 1498, 1970), the soil is classified as Low Plasticity Clay (CL)

Figure 1: Clayey soil

(c) PLASTIC

The waste plastic strip used is the study is collected locally. They are polyethylene terephthalate. It has a density of 1.38g/cc and thickness of .35mm. These are cut into strips of dimension 7.5mm *15mm. The tests were conducted at various strip contents of 0%, 0.25%, 0.5%, and 0.75% of dry weight of soil.

Figure 2: Plastic Strips

(d) CEMENT

Along with plastic strips some amount of cement is added, as cement is also an admixture which can improve or enhance properties of soil. It can reduce the effective clay content of a very high clay soil. Initially soil is mixed with cement at different proportions i.e., 0%, 1%, and 1.5% dry weight of soil. Optimum cement percentage at which maximum strength obtained is chosen.

Figure 3: Cement

METHODOLOGY

In this study the effect of inclusion of plastic strips on compaction and strength characteristic of soil have been investigated with varying percentages. The plastic strips are cut into strips of dimension 7.5mm * 15mm and mixed randomly with clayey soil in different proportions of 0%, .25%, 0.5%, .75%, of dry weight of soil. Unconfined compression test and CBR tests have been conducted as per relevant I.S. code provision.

California Bearing Ratio (CBR) Test:

The California Bearing Ratio or CBR test is performed in construction materials laboratories to evaluate the strength of soil sub grades and base course materials. CBR is the ratio expressed in percentage of force per unit area required to penetrate a soil mass with a standard circular plunger of 50 mm diameter at the rate of 1.25 mm/min to that required for corresponding penetration in a standard material. The CBR test is one of the most commonly used methods to evaluate the strength of a sub grade soil, sub base, and base course material for design of thickness for highways and airfield pavement

Figure 4: CBR Testing Machine

Unconfined Compression Strength (UCS) Test:

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The Unconfined Compression Test is a laboratory test used to derive the Unconfirmed Compressive Strength (UCS) of a specimen. Unconfirmed Compressive Strength (UCS) stands for the maximum axial compressive stress that a specimen can bear under zero confining stress. Due to the fact that stress is applied along the longitudinal axis, the Unconfined Compression Test is also known as Uniaxial Compression Test. Unconfined compression test is a special type of triaxial test in which confining pressure is zero i.e. (σ_3=0).

Figure 5: UCS Testing Machine

RESULT AND DISCUSSION

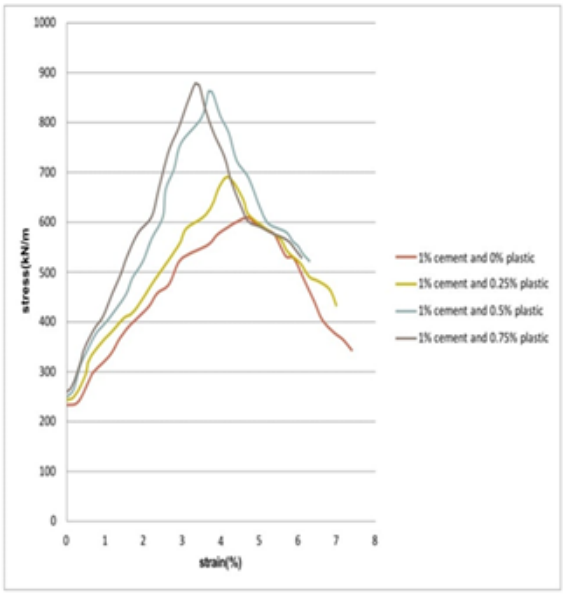
In this project UCS test and CBR test are performed which gives the strength of the soil. Results obtained from tests are drawn into graphs and comparison is done between soil sample mixed with different proportions of cement and plastic strips.

Table shows the comparison of tests

Table no: 1

PLASTIC STRIPS	CBR	UCS
0%	2.82	530
Soil and Cement	3.31	610
Soil, Cement and 0.25% of plastic strips	4.55	690
Soil, Cement and 0.5% of plastic strips	5.91	865
Soil, Cement and 0.75% of plastic strips	6.59	880

Graph below shown is obtained from UCS test



CONCLUSION

1. There is an increase in strength of soil with increase in the amount of cement added to the soil.
2. The soil having 1% cement and 0% plastic bottle strips content has strength of 610KN/m².
3. There is also an increase in the strength of soil by increasing the amount of plastic bottle strips added to soil.

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4. The strength of soil without any admixture is 530KN/m²which increases up to 880KN/m at a cement content of 1% and plastic bottle strips content of 0.75%.
5. There is an increase in the CBR value for soil with the increase in percentage of plastic strips.
6. The maximum CBR value obtained when plastic strips is of 7.5mm*15mm are added with 0.75% of dry weight of soil. Hence, the optimum percentage inclusion may be considered as 0.75% of dry weight of soil.
7. The optimum amount of plastic bottle strips to be added to enhance the strength of soil is 0.75% at a cement content of 1%

ACKNOWLEDGMENT

We wish to record our indebtedness and thankfulness to all those who helped us to prepare this report titled "STABILISATION OF CLAYEY SOIL USING PLASTIC STRIPS" and present it in a satisfactory way. First and foremost we thank God Almighty for his providence and for being the guiding light throughout the project. We are thankful to our Principal Dr. Brilly S Sangeetha, and the Head of the Department of Civil Engineering, Dr. S. Kamalakannan, for his sole co-operation. We would like to thank our guide Ms. Angela C Joy, Asst.prof.of Civil Engineering Deptford providing us guidance and support. Finally, we would like to extend our sincere gratitude to friends who always been helpful, in preparing and presenting the report and in the discussion following the presentation.

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ONLINE SHOPPING WITH AUGMENTED REALITY USING AI ASSISTANT

Anjana V J[1], K P Sruthi[2], Lima Mohan[3], Thasneem P N[4], Santhi P[5]
[1,2,3,4]UG Student, Department of Computer Science and Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala
[5]Assistant Professor, Department of Computer Science and Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala

Abstract –Augmented reality is a field of computer research which deals with the combination of reality with computer. This paper presents an innovative online shopping application of home decor with Augmented Reality using a voice assistant. The online shopping of home decor items using augmented reality let you to visualize how products will look in your home. This application will eliminate the human effort of physically visiting the furniture store which is very time consuming activity.

INTRODUCTION

Augmented Reality can be a system that incorporates three basic features: a combination of real and virtual worlds, real-time interaction, and accurate 3D registration of virtual and real objects. .The system of online shopping of home decor items using Augmented Reality allows users to see products beyond the box or showroom. Customers can choose an item to view and watch as it virtually appears in their home in true-to-life size. They can also attempt multiple combinations of furniture objects virtually without physically moving the furniture items. Customers can place various digitized pieces of furniture in their virtual room to see whether it fits or not. Online shopping of home decor using augmented reality will give consumer a combined experience of both traditional retail as well as modern-commerce.

RELATEDWORKS

Online shopping system using augmented reality offer an advanced experience for the customers by bringing digitized furniture objects directly into your room. In 2014 the paper proposed by Philipp Speer [1] used the Augmented Reality technology. This paper helps to figure out The use of an AR application. Major advantage is basically unlimited visualization possibilities and Lack of research in turn represents major burden for the implementation of AR retail is the important drawback. In 2015 Augmented Reality, Virtual Reality, RANSAC algorithm proposed by Anuroop Katiyar, Karan Karan [2].The proposed system allows the user to decide, where to place the object in real world. Its main advantage of this technology is that allows the user to augment a product of their wish and disadvantage is adds additional stress to OS, because a high processing power is required to augment .The paper introduced by Yuzhulu [3] presents a development of a prototype e-commerce system. The technologies used are augmented reality and Computer vision. Its advantage is improved indoor tracking and interaction technologies. Images are unstable is the major disadvantage. In 2016 Samriddhi Dongre, Saurav Dube [4] introduced an e-commerce portal for home decor shopping. It uses technologies like Virtual Reality, Augmented Reality-commerce and Bootstrap. Advantage of this project is that allow customers 'try' before they buy with a 3D product preview. A major disadvantage is requiring camera to capture. Snehal Mangale, Nabil Phansopkar [5] proposed a model in which the technologies used are Augmented Reality, Marker detection and Image processing. The merit is it eliminates human efforts by physically visiting the store which is time consuming. As a result this technology develops a virtual furniture application.' Towards a development of Augmented Reality for jewelry app' proposed by Revati Mukesh Raspayle, Prof. Kavita Kelkar [6] used the technologies such as Augmented Reality, 3D scanning. Major advantage is quick preview of new accessories .But the disadvantage is quality of

the product cannot be determined. Tity tony, Mary Kb, Regina Mary Joseph[7] proposed Content-based image intrieval.This paper helps to find out the challenges for future research directions in Augmented Reality. The major advantage is reduced visual acuity and he drawback is cost of this technology is too high. In 2017 Dario Huma [8], whose paper used technology such as Augmented Reality, cognitive computing. Advantage is to improve customer decision making and disadvantage is integration of technologies is complex. Nignnign Sun [9], university of Birmingham introduced a model suing the technology Visual Display. This paper helped to find the problem of AR online shopping and its solution. Advantage is saves time and eliminates the fatigue of shopping to the offline mall and disadvantage is high cost. In 2018 Sneha Sudharshan [10], who proposed a model in which the technologies used are tracking and registration, object detection and recognition ,calibration. Advantage is to enhance user experience and disadvantage is content management problem. 'A Designing Augmented Reality services for e-commerce: A project management perspective' proposed by Talib Tahirovic, Tamara Naumovic [11].This includes creation of a virtual catalog of products which consist of 3D models of product and their positioning in real space. The AR helps to improve business and contribute to user satisfaction with products and services. As a result of this technology indicate the possibility of improving efficiency and effectiveness of business by introducing AR concept. ShengCao, QianWang [12] using the technologies such as Augmented Reality, Mobile e–commerce proposed a model. It combines e-commerce with AR technology, improves AR perception and interesting of goods. Advantage is to create relaxed environment and disadvantage is Cost of software development is very expensive. In 2020 Shreyash Joshi, Pallav Walavalkar [13] introduced a application ,technology used are Android Application, e-commerce, Recommendation System.This project helps to visualize the product which the user want to buy in real world using AR.The advantage is Helps to increase the comfort of the user and also increases the ease of online shopping. Markus Lchtefeld et al. [14] Bringing online shopping experience to brick and mortar space is underway.he argues that physical point of sale will remain focal due to higher emotional connection, hence authors provides AR based advertising to bridge the digital gap. Jun Rekimoto et al. [15] coined the term Augmentable Reality and discussed the possibilities of using object IDs and locations to enrich an augmented reality application.

PROPOSED SYSTEM

In this Online shopping system using AR another feature is the AI assistant. This act as a virtual assistant that understands natural voice commands and completes the task of the user. Here the AI assistant give us the sorted products such as product between a price range etc .When we give them the voice command. This would helps us to get the products sorted

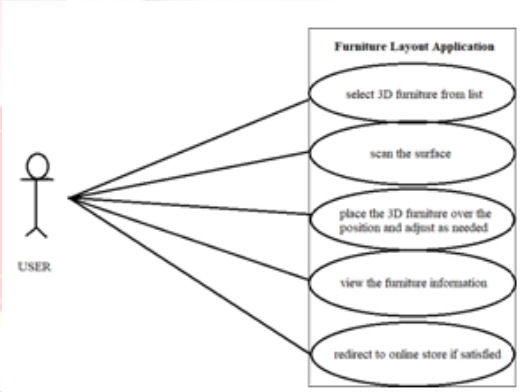

Fig. 1.Use case diagram.

and organized. Hence through this application, we can save the time and can operate at any place with network. So customer can have a face to face interaction with the products and this would enhance the user experience of trying products. The figure 1 shows the use case diagram of the application where the user interacts with the application using android device that supports AR camera. Firstly the new user needs to select which product he/she intends to purchase and accordingly select the product from the main page. After selecting the product by the user a window will pop which will access the camera. By using this AR camera the user scans the surroundings. There will be a marker which will be placed in such a way that the user can view it in a proper angle and then adjust the marker in the home environment where they want to view the product and verify whether it fulfill user needs . After viewing the project, the user can even change the product if they want to view any other or if satisfied they can move to online store . The actor here is the user and uses the cases . Select 3D furniture from list , scan the

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surface , place the 3D furniture over the surface and adjust as needed, view the furniture information, redirect to online store if satisfied .

CONCLUSION

The world is developing better technologies. These technologies are invented to help the human effort. The hectic life of human never ends. So it would be better if there something to reduce their work. Online shopping provides more user satisfaction and in- creased option to customers. The system proposed in this paper discuss bringing online shopping of home decor with Augmented Reality by choosing an item an viewing as it virtually appears in their home in true-to-life size. The proposed system would let the user to try on multiple combination of object virtually without physically moving the system. Augmented Reality marketing and retail are quite now, though we can see the significant growth of successful campaigns over the years. Retail is very fascinating field to explore Augmented Reality because the result can be seen in real and present figures, live feedback from the customers and often get viral exposure due to its novelty.

The innovative use of Augmented Reality helps to add this feature so that customers can view how the apparels or accessories will suit them. With the help of our technology whole way of shopping can be changed.

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Manufacturing of Brick using IHSA and Flyash

Athira Rajan[1], Athulya Varghese[2], Nidhin M R[3]
[1,2,3]PG Student, Department of Civil Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala, India.

Abstract – The sudden increase in population has increased construction activities. And in the present scenario, the construction activities take place in those lands which are of low quality. There are many methods are practiced to increase the performance of soil. Here one of the techniques that are used to improve the performance of low-quality soilisdiscussed.Geosynthetic Reinforcement is one such technique that helps in increasing the soil bearing capacity and helps in the reduction of settlement that is caused byvarious reasons. Prestressed Geosynthetic Reinforcement is one such technique that helps in increasing the soil bearing capacity and helps in the reduction of settlement that is caused by various reasons. The application of Prestressed Geosynthetic reinforcement results in an improvement in the performance of footing such as circular footing, square footing on various soil such as sandy soil, expansive soil.

Key words - Prestressed Geosynthetic Reinforcement, Bearing capacity, Settlement

1. INTRODUCTION

In an effort to present a satisfactory approach to waste disposal, flyash and IHSA, the two wastes are combined to form a structural material called "biofly brick". It is an innovative an approach to converting largely unacceptable waste into useful and useful materials.The main raw material for bricks are clay besides clay soils, soft slate and shale are used. Clays commonly used for brick making vary broadly in their composition and are dependent on the locality from which the soil originates. Clay bricks are very durable and fire resistant and require very little maintenance. Biofly bricks should be laid in different proportions of fly ash, IHSA and clay mixture. The structural and environmental suitability of the biofly brick have to be evaluated and they have been tested for various engineering properties.

2. MATERIALS AND METHODOLOGY

In this study, as a means to save the environment and a solution for the problem of waste disposal, the two important waste products such as IHSA and fly ash were combined with clay for the manufacture of fired clay bricks. In order to determine the proportion of these raw materials firstly fly ash clay bricks were casted. In fly ash clay bricks the various proportion of fly ash added are 5%, 10%, 15%, 20% respectively. the obtained optimum percentage of fly ash is made constant in biofly bricks, by varying the percentage of IHSA and clay. The various proportions of sludge ash mixed with clay in biofly bricks are 15%, 20%, 25%, 30% respectively. These biofly bricks are casted and they are tested for various mechanical properties and are compared with conventional brick. Fly ash is a fine glass powder recovered from coal burning gases during power generation. The combustion of at high temperatures pulverized coal and pressure at power stations produce different types of ash. The thin ash carries the fractional flue gases upwards and captures them before reaching them the atmosphere byhighly efficient electro static precipitators. This material is known as Pulverized FuelAsh (PFA) or 'fly ash'. Class C fly ash produced from the combustion of younger lignite or sub-bituminous coal has pozzolanic properties and some self-cementing properties. TP construction using C-fly ash Biofly brick is usually a common technology for waste treatment because it can reduce mass by 70%, reduce waste volume by up to 90% and recover recovery energy from waste to generate electricity. Solid waste incinerated ash and sewagesludgeashareusedinpartasrawmaterialsforcementclinker

productionandbrickby taking advantage of the high contents of SiO2, Al2O3 and CaO. Instead of converting this ash into silt, it is necessary to install a material utility system for combustible ash residues. Sincethesludgeashisheatedtohightemperatures in the incinerator all pathogenic organisms are killed and therefore has noadverse effect when in corporatedin the manufacture of abuildingmaterial. Common name for many beautiful, earthy materials that become plastic when wet. Chemically, clays are hydrous aluminum silicates, usually containing impurities, e.g. Small amounts of potassium, sodium, calcium, magnesium or iron. Individual clay particles are always smaller than 0.004 mm.The clay often forms collision suspensions when submerged in water, but the clay particles flow (clot) and settle quickly in the salt water. Clays are easily molded into aFormthat theyretain when dry,and theybecomehard and lose theirplasticitywhen subjected to heat.

Characteristics of clays include plasticity, shrinkage under firing and air drying, grain fineness, color, hardness, uniformity, and adhesive surface ability after firing. Clay is main raw material used universallyformakingbrick and isanatural resource. IHSA and fly ash have chemical composition close to that of clay. Thereforethe raw materials used for the purpose of manufacturing of biofly bricks are fly ash,IHSA and clay.. Fly ash is collected from a Hindusthan Newsprint Limited, Vellor.TheincineratedhospitalsludgeashusedinthemanufactureofbioflybrickiscollectedfromagovernmenthospitalatErnakulam .Theclayusedforthemanufacturingprocessiscollectedfrom abrick factory at Ettumanoor,Kottayam After obtaining the optimum percentage of fly ash-clay brick, fly ash content is fixed to the optimum value i.e. 15%. Then by varying the percentage of IHSA and Clay, biofly bricks are manufactured.

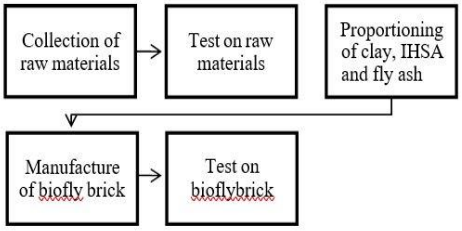

Table 2.1METHODOLOGY

MANUFACTUREOFBIOFLYBRICKS

SlNo:	Clay(%)	FlyAsh(%)	IHSA(%)
1	55	15	30
2	60	15	25
3	65	15	20
4	70	15	15

Table 2.2. Proportioningof bioflybrick

Materials used for the manufacture of biofly bricks are clay, fly ash and IHSA. Clay obtained from the field is dried under the sunlight until it is free frommoisture. The dried clay is crushed and sieved through the 2.36mm sieve and the claypassedthroughthesieveiscollected.Thecollectedclayisweigh batchedaccordingtotheproportions required. IHSA collected from hospital is sieved through the 300micron sieve. ThesievedIHSA is batched. Fly ash- 15% of fly ash is taken as optimum percentage and is kept constant for allmixed Clay,IHSA,flyash of required quantity is mixed on aneatplatformthoroughlyuntil thethreematerials aremixedproperlyto obtainauniform colour. Afterthedry mixing,therequiredwaterisaddedtothemixandmixedthoroughly until a uniform paste is obtained. Care should be taken to add adequatequantityofwaterotherwiseeaseof workabilitydecreases. Once a uniform paste is obtained, the mixture is placed in the mold and given the correct compaction of the mixture to avoid air vacuum formation. Now level the surface with a trowel and remove the excess paste with a trowel.Themould is kept as such for 45 seconds without any disturbance and then remove the mould carefully to avoid any disturbances which may otherwise result in cracking. After removing the mould, place fresh brick in shaded area to protect it from direct sunlight as exposure to direct sunlight can accelerate crack formation. Place the fresh brick in shade for 7 days. Special care should be taken while handling freshly prepared brick. After keeping the brick in shaded area for almost seven days, it is taken forburning in kiln. The bricks are arranged as shown in figure 5.1. After arranging thebrick, they are covered by clay on the surface to

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maintain the temperature as such foralmost 1 week. Firing of Biofly brick is done in brick kiln. Firewood is the mainsource of fuel. Brick is fired to a temperature of 9000C - 10000C. After keeping thebrickin kiln foralmost 1 week,the brick becomesreadyto use

Sl No.	Load(KN)	Area(mm^2)	Compressive strength (N/mm^2)
1	86	19000	4.52
2	98	19000	4.84
3	90	19000	4.736

4. RESULT AND DISCUSSION

4.1 TESTSONCONVENTIONALBRICKS

Conventional bricks were tested to determine compressive strength, water absorption, fluorescence, hardness, and sound energy.

Table4.1.1.CompressiveStrengthTest

Table4.1.2.WaterAbsorption

Sl No.	Dryweight (kg)	Wetweight(kg)	Waterabsorption (%)
1	2.676	3.219	20.29
2	2.764	3.322	20.18
3	2.641	3.209	21.5
4	2.753	3.301	19.9

TestResults

4.2 TESTSONBIOFLYBRICKS

Varioustestswereconductedonbioflybricksatdifferentpropositio nclay,flyash,IHSA. Thetests wereconductedaccordingto the IS 3495 (Part 1 to 4):1992. The compression test is one of the most important tests to ensure the engineering quality of a building material. Results of compressive strength test made on different bricks. The ratios of clay, fly ash and IHSA are as follows.

Water absorption is an important factor in determining the strength and durability of bricks. After conducting the test in accordance with IS specification theresults are studied. It is observed that the water absorption of biofly brick is increasingas the percentage of the IHSA increases. The increase in water absorption due to theincrease of IHSA is because of the bonding ability of ash, clay and fly ash is muchless. The efflorescence is the crystalline salts deposited on the surface of brickswhen water percolates through the bricks. After placing the end of the bricks in the dish, immerse them in water to a depth of 25 mm so that all the water in the dish is absorbed into the sample and the surface water evaporates Then the brick is observed forfindingtheefflorescenceinthesurface.Theresultofobservation isgivenintable 6.10. For 15% and 20% of IHSA, efflorescence observed is nil. Whereas for 25% and30% of IHSA the efflorescence observed is slight. Efflorescence in bricks can begrouped under nil, slight,moderate andheavy.

Table4.2.1CompressiveStrengthResults

Table 4.2.2. efflorescence:hardness:soundnessTests Results

Hardness of brick is the resistance to scratching or cutting. The hardness test iscarried out by scratching on the surfaces of the bricks by fingernails. No impressionsare left on the brick.

Table4.2.3 Water Absorption Test

Proportion (Clay:Flyash:IHSA)	No	DryWeight(M1) (Kg)	Wet Weight(M2) (Kg)	WaterAbsorption (%)	AverageWaterAbsorption(%)
55:15:30	1	1.932	2.380	23.18	22.739
	2	1.952	2.381	21.97	
	3	1.947	2.396	23.06	
60:15:25	1	1.950	2.369	21.48	21.91
	2	1.978	2.376	21.38	
	3	1.893	2.376	22.87	
65:15:20	1	1.938	2.338	20.64	20.41
	2	2.033	2.439	19.97	
	3	1.972	2.379	20.03	
70:15:15	1	2.102	2.485	18.220	18.19
	2	2.080	2.471	18.790	
	3	2.163	2.543	17.560	

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5. COST ESTIMATION OFBIOFLY BRICK

Thecostofaconventionalbrickis₹8.5.Therawmaterialsusedinthemanufactureof Bioflybricks are clay, flyashandIHSA.Here the clayandflyashare available at a cost of ₹1500/tonne and ₹1600/tonne respectively. But the IHSA isavailable freeof cost.Therefore themanufacturing costof biofly brick islessthanthat of conventionalbrick.

6. RECOMMENDATIONSFOR FURTHERSTUDY

The following are the recommendations for future research. The durability study of the casted bio fly bricks can be conducted in order to assess the suitability of this material for construction purposes. It is possible to conduct further studies on manufacturing of fired clay bricks with partial replacement of clay with waste materials like water treatment plant sludge,polystyrene,kraftpulpresidue,processedwastetea,ricehusk,pineappleleaves,straw, bagasse, sawdust, tobacco residues, tannery waste, grass, paper, cigarette buttsetc.

Proportion(Clay:Fly ash:IHSA)	Sample No:	Breaking Load(KN)	Area ofsurface	CompressiveStrength	Averagecompressivestrength
55:15:30	1	50	19000	2.63	2.73
	2	60	19000	3.16	
	3	40	19000	2.42	
60:15:25	1	50	19000	2.63	2.87
	2	60	19000	3.16	
	3	50	19000	2.63	
65:15:20	1	70	19000	3.68	3.33
	2	50	19000	2,63	
	3	70	19000	3.68	
70:15:15	1	80	19000	4.63	4.80
	2	90	19000	4,73	
	3	80	19000	5.02	

SL. NO :	Proportion(Clay:fly ash:IHSA)	Observed Result		
		Efflorescence	Hardness	Soundness
1	70:15:15	Nil	Hard	Sound
2	65:15:20	Nil	Hard	Sound
3	60:15:25	Slight	Hard	Sound
4	55:15:30	Slight	Hard	Sound

7. CONCLUSIONS

Incinerated hospital sludge ash and fly ash are some of the waste materialsproducedfrom hospitalwaste andcoal industry respectively. Utilization of thesewaste materials has been encouraged as one of the most cost-effective alternative wayinbrickmaking.InsteadofclayIHSAandflyashareusedinparticularproportionstomakebioflybricks.Sincethebioflybrickshave passedallthetestssuchascompressive strength, water absorption, hardness, soundness and efflorescence, thispartial replacement will not only helps to produce low cost bricks but also helps in asound disposal method of the potential polluting waste like IHSA and fly ash. Animproved compressive strength of 4.39 N/mm² was obtained for biofly bricks than theminimum value 3.5 N/mm². Thus a higher strength is obtained for the structure withless dead weight. A mix proportion of 15:15:70 (IHSA: fly ash: clay) of biofly bricksholds good physical and mechanical properties such as low density, reduced weightand better strength. The water absorption in percentage of biofly bricks of the samemix proportion was found to be 18.19%. The reduced water absorption shows thefeasibility of using biofly bricks in water scares region and a higher strength. Alsothereisamanufacturingcostdifferenceofapproximately₹1betweentheconventional and biofly bricks. The energy consumption during firing of biofly brickswas very less, which is a great achievement in biofly manufacturing. Hence it can beunderstood that the replacement of clay by IHSA and fly ash in conventional bricks ina mixproportion of 15:15:70, introduces agood quality,costeffective andeco-friendly bricksintothefieldofbuildingmaterials.Noadditionaltechniquesareneededforthemanufactureorbioflybricks.Thusbioflybrickissai

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dtobeeconomicallyfeasible, environmentallyfeasibleand technicallyfeasible.

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Heart Disease Prediction Using Machine Learning Techniques

Hasna V N[1], Ms. Hrudya K P[2]

[1]PG Student, Department of Computer Science and Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala

[2]Assistant Professor, Department of Computer Science and Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala

Abstract -Heart plays important role in living organisms. diagnosing and prediction of heart connected diseases needs additional exactitude, perfection and correctness as a result of a bit mistake will cause fatigue drawback or death of the person, there are a unit various death cases associated with heart and their numeration is increasing exponentially day by day. To upset the matter there's essential want of prediction system for awareness regarding diseases. Machine learning is that the branch of computing (AI), it provides prestigious support in predicting any reasonably event that take coaching from natural events. During this paper, we have a tendency to calculate accuracy of machine learning algorithms for predicting heart condition, for these algorithms area unit k-nearest neighbor, decision tree, logistic regression, random forest, naïve Bayes and support vector machine (SVM) by exploitation UCI repository dataset for coaching and testing. For implementation of Python programming Anaconda (Jupyter) notebook is best tool, that have many varieties of library, header file, that build the work additional correct and precise.

Keywords: Logistic Regression, K nearest Neighbor, Support vector machine, Decision Tree, Random Forest and naïve bayes

INTRODUCTION

The heart is that the organ that pumps blood, with its life-giving atomic number 8 and nutrients, to all or any the tissues of the body. If the pumping action of the guts becomes inefficient, very important organs like brain and kidneys suffers, if the guts stop operating altogether, death happens at intervals minutes. The heart sickness has been thought of in concert of the complicated and life deadliest human diseases Within the world. Life itself is totally captivated with the economical operation of heart. Symptoms of cardiopathy embrace shortness of breath; weakness of human body, swollen feet and fatigue and its mentioned in the guts sickness diagnosing and treatment are terribly complicated, particularly within the developing countries, thanks to the rare accessibility of diagnostic equipment and alternative resources that have an effect on correct prediction and treatment of heart patients. This makes cardiopathy a significant concern to be controlled. However, it's troublesome to spot cardiopathy owing to many contributive risk factors like polygenic disease, high vital sign, high cholesterol, abnormal heart rate, and lots of alternative factors. The invasive–based techniques to the diagnose of cardiopathy are supported the analysis of the patient's anamnesis, physical examination report and analysis of involved symptoms by medical examiners. typically, there's a delay within the diagnosing thanks to human errors. Thanks to such constraints, scientists have turned towards fashionable approaches like data processing and Machine Learning for predicting the sickness. Data processing plays a crucial role in building intelligent model for medical system to discover the guts sickness victimization the obtainable dataset of patients that involves risk issue related to the sickness. Medical practitioners could give facilitate for the detection. Many computer codes tools and numerous algorithms are projected by researchers for developing effective medical call network. Machine learning helps computers to find out and act consequently. It helps the pc to find out the complicated model and predict information and additionally has the power to calculate complicated arithmetic on huge data. The machine learning based mostly cardiopathy predicting systems are

going to be precise and can cut back the danger. The worth of machine learning technology is recognized well in health care trade that has giant pool of information. It helps medical examiners to predict the sickness and result in improvise the treatment. Machine learning prophetical models like decision tree, k-nearest neighbor, logistic regression, random forest, support vector machine and naïve bayes are used to predict whether or not someone has cardiopathy or not. However, medical information is typically constricted by smaller sets of observations than what's typically most popular to permit for adequate coaching and testing of models designed victimization machine learning algorithms. While not sufficiently sized information sets, it's terribly troublesome to work out if a model is generalizable to antecedently unseen sets of information. Using artificial information to beat constraints inherent in tiny medical analysis information sets can be an answer to guard patient privacy and permit for application of machine learning algorithms. The larger information sets leave sufficiently sized coaching and testing partitions that alter the machine learning algorithmic program to find out from expertise by exposure to an outsized set of observations, so to be tested upon another giant set of observations that haven't antecedently been introduced to the model. victimization the artificial information, we tend to train and validate the Machine Learning Models then compare the prediction outcome accuracy to it victimization the first observations. Once happy with the consistency of classification prediction between the first information set and also the surrogate information set, we tend to generate Associate in Nursing expanded surrogate information set in stage 3. Whereas supported the Cleveland information set, this expanded set contains antecedently unstudied attributes. This expanded information set is employed to check and train a neural network model victimization the Kera's API for Python, having partitioned off the artificial information into giant testing and coaching subsets. We tend to then compare the result of the prediction accuracy of the deep learning model to the standard machine learning models. We discover that victimization the expanded surrogate information set to create a deep learning model ends up in the simplest classification prediction accuracy and stability.

The rest of the paper is organized as follows; Section two discusses survey on machine learning techniques for predicting UCI Repository. Section three provides projected system style, algorithms and ways used for cardiopathy prediction. Section four discusses performance analysis of Cleveland and artificial dataset and also the results that were achieved. Finally, Section five ends with a conclusion of current work and a few notes on future improvement.

I. RELATED WORKS

Many surveys on heart condition information are taken from Cleveland information set that contains many samples. Below shows comparison analysis of various machine learning techniques used for heart disease prediction

AUTHOR	SOURCE OF DATA	METHOD	ACCURACY
SP.Rajamhona, Analysis of neural network based heart disease prediction system2018	Cleveland Heart Disease Data set	Artificial Neural Network (ANN)	80.46%
Salma Banu N.K., Prediction of heart disease at early stage using data mining and big data analytics. 2016	Cleveland Heart Disease Data set	Naive Bayes, Decision Tree, SVM	84.1%
PurusothamaDifferent classification techniques to design risk prediction model for HD , 2015	Cleveland Heart Disease Data set	decision technique, association rule, K-NN, artificial neural network, naive bayes, hybrid approach	83.66%
Jabbar, Heart Disease Prediction Using Surrogate Data. 2011	Cleveland Heart Disease Data set	Disease Data set association rule techniques and ML algorithms.	83.7%
Milan Kumari, Comparative Study of Data Mining Classification Methods in Cardiovascular Disease Prediction. 2011	Cardiovascular disease dataset	Support Vector Machine, Artificial neural networks (ANNs), Decision Tree, and RIPPER classifier	84.7%
Amin Ul Haq , Jian Ping Li , Muhammad Hammad Memon , Shah Nazir and Ruinan Sun, A Hybrid Intelligent System Framework for the Prediction of Heart Disease Using Machine Learning Algorithms, 2018	Cleveland Heart Disease Data set	Feature selection algorithms such as Relief, mRMR and LASSO machine learning classifiers logistic regression, KNN, ANN, SVM, DT, and NB	77%
christalinLathaS. CarolinJeeva, Improving the accuracy of prediction of heart disease risk based on ensemble classification techniques, 2019	UCI repository Cleveland dataset	ensemble classification techniques, such as bagging and boosting	93%

Table1: Survey of Heart disease prediction using Machine learning algorithms

PROPOSED SYSTEM

Processing of system begin with the knowledge assortment for this we've a bent to uses the UCI repository dataset that's well verified by vary of researchers and authority of the UCI . Cardiopathy might be a data set available in UCI repository

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furthermore as is downloaded from Cagle. Predicting whether or not or not somebody contains a 'Heart Disease' or 'No Heart Disease'. Typically this can be} often associate example of supervised Machine Learning as a result of the output is already legendary. It is a Classification draw back. As we've to classify the result into 2 classes: 1(ONE) as having cardiopathy and 0(Zero) as not having cardiopathy.

There unit fourteen choices (Columns) beside the target. The knowledge set includes choices like:

1) slope_of_peak_exercise_st_segment (type: into): the slope of the peak exercise ST segment, an electrocardiography read out indicating quality of blood flow to the heart
2) thal (type: categorical): results of thallium stress test measuring blood flow to the heart, with possible values normal, fixed defect, reversible defect
3) resting_blood_pressure (type: into): resting blood pressure
4) chest_pain_type (type: int): chest pain type (4 values)
5) num_major_vessels (type: int): number of major vessels (0-3) colored by flourosopy
6) fasting_blood_sugar_gt_120_mg_per_dl (type: binary): fasting blood sugar > 120 mg/dl
7) resting_ekg_results (type: int): resting electrocardiographic results (values 0,1,2)
8) serum_cholesterol_mg_per_dl (type: int): serum cholestoral in mg/dl
9) oldpeak_eq_st_depression (type: float): oldpeak = ST depression induced by exercise relative to rest, a measure of abnormality in electrocardiograms
10) sex (type: binary): 0: female, 1: male
11) age (type: int): age in years
12) Max_heart_rate_achieved (type: int): maximum heart rate achieved (beats per minute)
13) exercise_induced_angina (type: binary): exercise-induced chest pain (0: False, 1: True)
14) Target: describes the target class (0 for no heart disease, 1 2 3 4 for having heart disease).

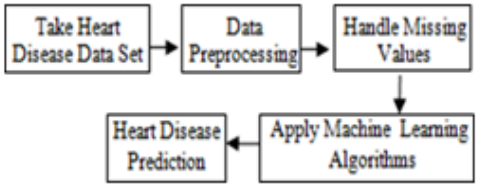

Figure1: Systemarchitecture

There are several steps in our project. They're listed below:

A. Data Collection

Initiative for declaration system is knowledge assortment and deciding regarding the coaching and testing dataset.

B. Attribute Selection

Attribute of dataset are property of dataset that are used for system and for heart several attributes are like heart bit rate of person, gender of the person, age of the person and plenty of additional.

C. Data preprocessing

Preprocessing required for achieving prestigious result from the machine learning algorithms. As an example, Random forest algorithmic rule doesn't support null values dataset and for this we have got to manage null values from original information. For our project we have got to convert some classified price by dummy price suggests that within the kind of "0"and "1" by exploitation following code:

D. Data visualization & Analysis

First we will find the correlation among the attributes, to ascertain the connection between completely different options and make out any linear relation between them we tend to take facilitate of PAIRPLOTS. With Histograms we are able to see the form of every feature and provide the count of variety of observations in each bin.

MACHINE LEARNING ALGORITHMS

Here we used six types of machine learning algorithms to predict the heart disease. The ML Algorithms are:

SUPPORTVECTORMACHINE

SVM is machine learning algorithm usedforclassification/regression. It classifies both linear and non-linear data. Its separate data based on labels. The technique, kernel trick used to match new data to best from training data to predict unknown target label. Learn from past labeled data and predict future. Data from two classes can always be separated by a hyper plane. The SVM find this hyper plane using support vectors and margins.SVM performs classification tasks by maximizing the margin separating both classes while minimizing the classification errors. Binary

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classification problem, the instances are separated with a hyper plane $w^Tx+b=0$, where w and are dimension alcoefficientvectors,which are normal to the hyper plane of the surface,bisoff set value from the origin, and x is data set values. The SVM gets results of w and b. w can be solved by introducing Lagrangian multipliers in the linear case. The data points on borders are calledsupport vectors. The solution of w can be written as $w = \sum^n \alpha y x$, where n is the number of support vectors and yi are target labels to x. The value of w and b are calculated, and the linear discriminant function can be written as follows:

$g(x) = sgn(\sum^n_{i=1} \alpha_i y_i x^T x+b)$

The nonlinear scenario, for kernel trick and decision function, can be written as follows:

$g(x)= sgn(\sum^n_{i=1} \alpha_i y_i K(x_i + x)+b)$

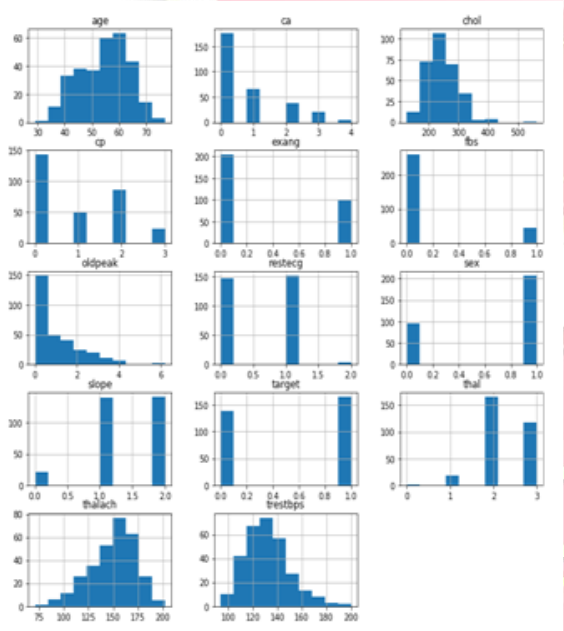

Figure2: Histogram Representation

DECISIONTREE

A decision tree could be supervised machine learning Algorithmic program. Decision tree form is simply a tree wherever each node could be a leaf node or decision node. The techniques of the choice tree square measure easy and simply perceivable for a way to require the choice. a call tree contained internal and external nodes connected with one another. the interior nodes square measure the decision-making half that creates a call and therefore the kid node to go to consequent nodes. The leaf node on the opposite hand has no kid nodes and is related to a label. The trees square measure made supported high entropy inputs.

Entropy= $\sum^c i=1-$ pilog2 pi

RANDOMFOREST

Random forest may be a tree based mostly classification formula. because the name indicates, the formula creates a forest with an oversized variety of trees. It's AN ensemble formula which mixes multiple algorithms. It creates a group of call trees from a random sample of the coaching set. It repeats the method with multiple random samples and makes a judgement supported majority option .The Random forest formula is effective in handling missing values however it's susceptible to over fitting. acceptable parameter standardization is applied to avoid over fitting.

LOGISTICREGRESSION

It is an applied mathematics model. A supplying regression may be a classification algorithmic program. For binary classification downside, so as to predict the worth of prognostic variable y once $y \in [0, 1]$, zero is negative category and one is positive category. It additionally uses multi classification to predict the worth of y once $y \in [0, 1, 2, 3]$. so as to classify 2 categories zero and one, a hypothesis $h(\theta) = \theta$ Texas X are going to be designed and threshold classifier output is he(x) at zero.5. If the worth of hypothesis $h\theta (x) \geq$ zero.5, it'll predict y =1 that mean that the person has heart condition and if worth of $h\theta(x) <$ zero.5, then predict y = zero that shows that the person is healthy. Hence, the prediction of supplying regression below the condition zero zero$h\theta(x)$ zero one is completed. Logistic regression sigmoid operate is written as follows:$h\theta(x)= g\theta^T$-X,where g(z)1/(1 +x−z)and$h\theta(x)$=1/(1+ x−z).Similarly, the logistic regression cost function can be written as follows:

$J(\theta)=1/m\sum^m cost(h\theta(x^{(I)})y^{(i)})$

K-NEARESTNEIGHBOUR

K-NN may be a supervised learning classification algorithmic program. K-NN algorithmic program predicts the category label of a replacement input. K-NN utilizes the similarity of latest input to its inputs samples within the coaching set. If the new input is same the samples within the coaching set. The K-NN classification performance isn't sensible. Let (x, y) be the

coaching observations and therefore the learning perform h: X ⟶ Y, so given associate degree observation x, h(x) will verify y price.Euclidean distance functiond(xi, y j) and therefore the majority of k-nearest neighbour. d(xi, y j)=√∑(xi-yi)^2

NAIVEBAYES ALGORITHM

The Naive Bayes Algorithm is another Machine Learning algorithm for classification problems. Naive Bayes is an efficient classification algorithm in data mining that can handle missing values during classification.

RESULTS & ANALYSIS

ACCURACY

Accuracy is a metric for evaluating classification models. Accuracy of the algorithms are depends on four values namely true positive (TP), false positive (FP), true negative (TN) and false negative (FN).

Accuracy= (FN+TP) / (TP+FP+TN+FN)

The numerical value of TP, FP, TN, FN defines as:

TP= Number of person with heart diseases

TN= Number of people with heart diseases and no heart diseases

FP= Number of persons with no heart diseases

FN= Number of persons with no heart diseases and with heart diseases

Table 2: Different algorithms Precision, Recall &Fmeasure

Algorithm	Precision	Recall	F-measure	Accuracy
Decision Tree	0.78	0.77	0.77	90%
Logistic Regression	0.92	0.94	0.91	92%
Random Forest	0.85	0.85	0.85	86%
Naive Bayes	0.837	0.911	0.873	85.25%

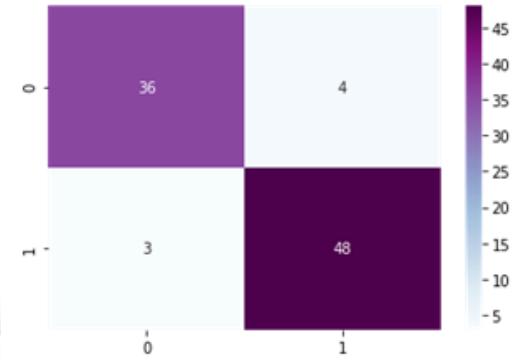

Figure 3: Logistic regression confusion matrix

PRECISION

Precision is that the fraction of heart diseases that were expected to be heart diseases and were really heart diseases. Whereas, Recall measures the fraction of true cases of heart condition that were detected. It additionally takes under consideration those values that were incorrectly rejected by the rule. We tend to observe that the recall for '1' that is having heart condition is higher which means that the rule is incorrectly rejecting some cases. Precision (also called positive prophetic value) is that the fraction of relevant instances among the retrieved instances. Preciseness is calculated by these equations follows.

Precision = TP/ TP+FP

RECALL

Recall (also referred to as sensitivity) is that the fraction of the overall quantity of relevant instances. Recall is calculated by victimization these equation

Recall = TP / (TP+ FN)

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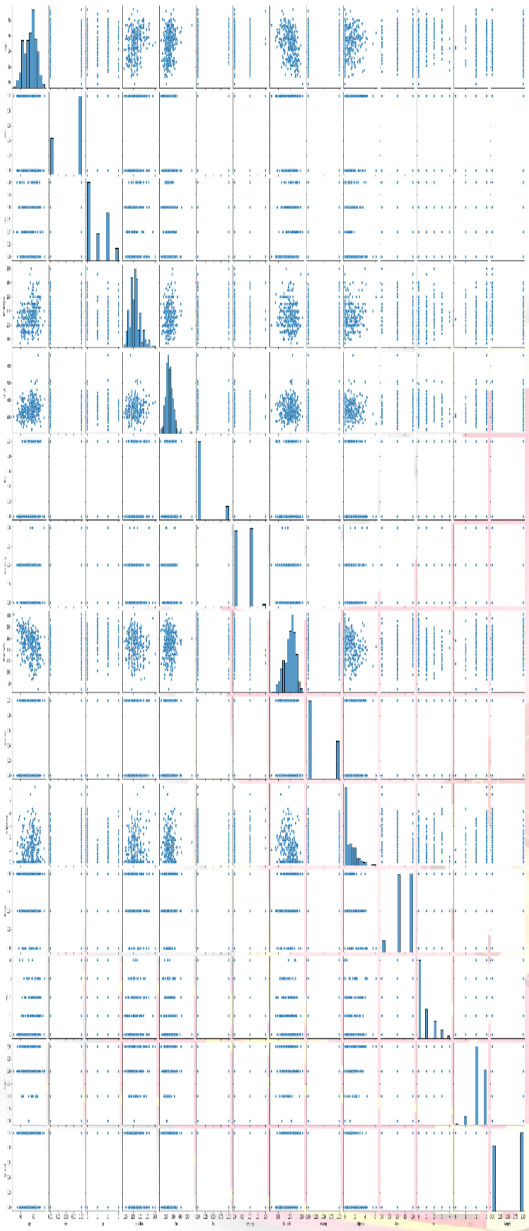

Figure 4: Positive & Negative Correlation B/W All Attributes

Table 3: Accuracy of different algorithms

Algorithms	Accuracy
Logistic Regression	92%
Naïve Bayes Classifier	90%
K Nearest Neighbors Classifier	83%
Decision Tree Classifier	90%
Support Vector Classifier	87%
Random Forest Classifier	86%

II. CONCLUSION

With the increasing range of deaths because of heart diseases, it's become necessary to develop a system to predict heart diseases effectively and accurately. The motivation for the study was to seek out the foremost economical metric capacity unit algorithmic rule for detection of heart diseases. This study compares the accuracy score of decision Tree, KNN, SVM, logistic Regression, Random Forest and Naive Bayes algorithms for predicting heart condition victimization UCI machine learning repository dataset. The results of this study indicates that the Logistic regression algorithmic rule is that the most effective algorithmic rule with accuracy score of 92% and decision tree, naive Bayes with accuracy 90% of prediction of heart condition. In future the work is often increased by developing an online application in addition as employing a larger dataset as compared to the one utilized in this analysis which can facilitate to produce higher results and facilitate health professionals in predicting the center unwellness effectively and with efficiency.

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Machine Learning Approach to Reduce Dimensional Space in Large Datasets using PCA and LDA

Jessin Shah P A[1], Dr. G Kiruthiga[2]
[1]PG Student, Department of Computer Science and Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala, India
[2]Associate Professor, Department of Computer Science & Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala, India

Abstract – Several sectors like health, production, web, organizations, generate huge volume of data due to digitization. Machine learning algorithms can be used to uncover patterns among the attributes of this data and make predictions that can be used by the medical practitioners and people at managerial level to make decisions. All attribute gathered might not contribute to the prediction and by removing or ignoring irrelevant attributes reduces the burden on machine learning. In this two prominent dimensionality reduction techniques Linear Discriminate Analysis (LDA) and Principal Component Analysis (PCA) are investigated on two popular Machine Learning (ML) algorithms, Support Vector Machine (SVM) and Random Forest Classifier using publicly available epileptic seizure recognition dataset from University of California and Irvine Machine Repository. The experiment first checks the performance of SVM and random forest classifier without dimensional reaction of dataset. Then reduce dimension of dataset by applying PCA and LDA and the performance of above-mentioned Machine learning algorithms is investigated using this reduced dataset. Then compare the results to show which technique yields the better results.

Introduction

Data is growing day by day and at a fast rate. Every data we see is stored digitally. As the data is growing, demand for storage space required to store such a data is also high. Depending on the type of process, data collected from different sources make huge volume of datasets and create multidimensional datasets [1]. Analysis of high dimensional dataset is difficult for researchers. In this situation dimension reduction plays a vital role. Dimensionality reduction basically consists of reducing the number of arbitrary attributes under Consideration. Reducing number of attributes can be considered as a process of reducing some features or columns in dataset without losing much of vital aspects of the primary dataset. In real world applications high dimensional data reduction is pre- processing step. Different types of methods used in dimensionality reduction are Principal Component Analysis (PCA), Linear Discriminate Analysis (LDA) and Generalized Discriminate Analysis (GDA). Based on the methods used, dimensionality reduction can be linear or non-linear. Some of the advantages of dimensionality reduction include data compression, reduced use of storage, eliminate irrelevant features and reduce computation time. Some advantages are also present like data loss, curse of dimensionality. The author ET. Al [2] presents adaptive hybrid feature selection based classifier ensemble (AHFSE) for epileptic seizure classification. In this AHFSE creates new sample subsets in every bootstrap using adaptive hybrid feature selection. In this their algorithm takes longer time to obtain compact sample subsets. The author ET. Al [3] author present a new framework for multi-label learning with a large number of classes labels and features namely MLL-FLSDR. Both feature space and label space are reduced to low dimensional spaces respectively, in which local structure of data points is utilized to constrain the geographical structure on both the learned low dimensional space and guarantee the qualities of them. The author ET. Al [4] presents neighbors-based distance that measures distance of two examples through their neighbors. This can be applied to classical dimensionality reduction methods, whether linear or nonlinear, and achieve substantial performance. An algorithm named DRWPCA presented by author ET. Al [5] reduces dimension by analyzing the correlation between the

dimensions and therefore the physical meaning of the original dataset is retained. They utilized optimization algorithm in this to get most suitable parameters, so that algorithm performance is optimal. The experiment show better dimensionality reduction ability and higher accuracy than PCA. The following machine learning algorithms are used for the complex task of handling large datasets related to big data challenges.

Support Vector Clustering Algorithm

Support vector clustering (SVC) is a newly and nonparametric clustering algorithm which is based on the support vector approaches presented by Ben-Hur et.al [6]. SVC does not make any theory on the amount or form of the clusters in the data. Also, by using a kernel function, SVC can map data points from data space to a high dimensional feature space. With using the Support Vector Domain Description algorithm (SVDD) in the kernel's feature space, the algorithm seeks the smallest sphere that surrounds the image of the data. This sphere makes a set of contours that embed the data points when mapped back to data space. Then contours interpreted as cluster boundaries, and points enclosed by each contour are linked by SVC to the corresponding cluster. If the data is high-dimensional, a preprocessing step like using principal component analysis (PCA) can be effective, since SVC is a proper algorithm for low-dimensional data.

Random Forest Algorithm

Random Forest creates many numbers of decision trees and merges all the decision trees to obtain the highest accuracy and further constant prediction [7]. Random Forest method performs by regarding the random feature subset selection for the splitting of a node [8]. Alternatively of finding for the optimum probable saturation points as in common decision trees, for every feature, it uses optional thresholds to gain the decision trees utmost random. This procedure does well, as the summation of more decision trees minimizes the noise impact which leads to giving further accurate results, whereas a particular decision tree can prone to noise effect. The drawback is that generated subsets of various decision trees may tend to overlap and also it is difficult to understand. The main disadvantage is taking the maximum number of trees produces ineptness in the technique and making to work slow and not fit for real-time predictions. In this paper dimensionality reduction methods Principal Component Analysis and Linear Discriminate Analysis are implemented. Impact of these two dimensionality reduction techniques on the performance of Machine learning algorithms like Support Vector Machine and Random Forest Classifier is investigated. For this we use epileptic seizure recognition dataset from University of California and Irvine Machine Repository. In this first, performance of each machine learning technique is observed, and then PCA and LDA are used for dimensionality reduction. Next the extracted features are used to train the above-mentioned ML algorithms. Then compare the performance of ML algorithms without dimensionality reduction technique and with the application of PCA and LDA. The remainder of this paper can be listed as follow. In Section II, methodology used into his paper is presented, where PCA and LDA are defined and the methodology implemented is described. In Section III, results and discussions of the proposed model is described. Section IV concludes the observations made from the implementation.

METHODOLOGY

In this section, first discuss two popular dimensionality reduction techniques, Principal Component Analysis and Linear Discriminate Analysis and Linear Discriminate Analysis, then proposed methodology is discussed.

A. Dimensionality Reduction Techniques

1. Principal Component Analysis (PCA)

PCA is a statistical procedure which uses an orthogonal transformation. PCA converts a group of correlated variables to a group of uncorrelated variables [9]. PCA is used for exploratory data analysis and also for examination of the relationships among a group of variables. Hence it can be used for dimensionality reduction.

Assume that a dataset $x^{(1)}, x^{(2)},.....x^{m}$ has n dimension inputs. Using PCA this n-dimension data has to be reduced to k-dimension ($k \ll n$). PCA is described below:

1) Standardization of the raw data: The raw data should have unit variance and zero mean.

$$x_j^i = \frac{x_j^i - \bar{x}_j}{\sigma_j} \quad \forall j$$

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2) Calculate the co-variance matrix of the raw data as follows:

$$\sum = \frac{1}{m}\sum_{i}^{m}(x_i)(x_i)^T, \sum \in R^{n*n}$$

3) Calculate the eigenvector and eigenvalue of the co-

$$u^T \sum = \lambda\mu$$

$$U = \begin{bmatrix} | & | & | \\ u_1 & u_2 \dots & u_n \\ | & | & | \end{bmatrix}, \quad u_i \in R^n \qquad 1.1$$

4) Variance matrix as given in (1.1).

Raw data has to be projected into a k-dimensional subspace: Top k eigenvector of co-variance matrix are chosen. These will be the new, original basis for the data. The Calculation of corresponding vector is

$$x_i^{new} = \begin{bmatrix} u_1^T x^i \\ u_2^T x^i \\ ::::: \\ ::::: \\ u_k^T x^i \end{bmatrix} \in R^k \qquad 1.2$$

5) In (1.2).

In this way if the raw data is with n dimensionality, it will be reduced to a new k dimensional representation of the data.

Linear Discriminate Analysis (LDA)

LDA is another popular dimensionality reduction approach for pre-processing step in data mining and machine learning applications [10]. The main aim of LDA is to project a dataset with high number of features onto a less-dimensional space with good class-reparability. This will reduce computational costs. The approach followed by LDA is very much analogous to that of PCA. Apart from maximizing the variance of data (PCA), LDA also maximizes separation of multiple classes. The goal of Linear Discriminate Analysis is to project a dimension space onto a lesser subspace i (where $i \leq x - 1$) without disturbing the class information.

The 5 steps for performing a LDA are listed below.

1) For every class of dataset, a d-dimensional means vectors is computed.
2) Computation of scatter matrices is carried out.
3) The eigenvectors (E_1, E_2, E_3, ...E_d) and their corresponding eigenvalues (ψ_1, ψ_2, ψ_3, ...ψ_d) of the scatter matrices are computed.
4) Sort the eigenvectors in descending order of eigenvalues and then opt for k eigenvectors which have maximum eigenvalues in order to form a d ∗i matrix WW.
5) Use the above d ∗i eigenvector matrix for transforming the input samples into a new subspace. i.e., YY = XX ∗ WW.

PCA and LDA are linear transformation techniques which can be used to reduce the number of features that is the dimensionality reduction. PCA is an unsupervised algorithm where as LDA is supervised.

Methodology

This work investigates the effect of dimensionality reduction techniques on the performance of ML algorithms on epileptic seizure detection dataset. The various steps in this work are:

1. In step 1, Standardize features by removing the mean and scaling to unit variance.
2. In step 2, dataset is experimented using ML algorithms, Support Vector Machine and Random Forest. The performance of these classifiers it's then evaluated on the metrics. Precision, Recall, F1-Score, Accuracy.

In step 3, PCA is applied on the pre-processed dataset. The resultant dimensionally reduced dataset is then experimented using the aforementioned ML

1. Algorithms. The results obtained are again evaluated using the metrics mentioned in step2.
2. In step 4, LDA is applied on the pre-processed dataset to extract the most prominent features. The resultant dataset is then experimented on the ML algorithms. The ML algorithms using LDA are evaluated on the metrics mentioned in step2.
3. In step 5, the results obtained by the ML algorithms without dimensionality reduction and also ML algorithms with PCA and LDA are analyzed. The effect

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of dimensionality reduction on the performance of ML algorithms is investigated.

Fig 1 shows the proposed methodology. The effect of dimensionality reduction on ML algorithms is evaluated in the next section.

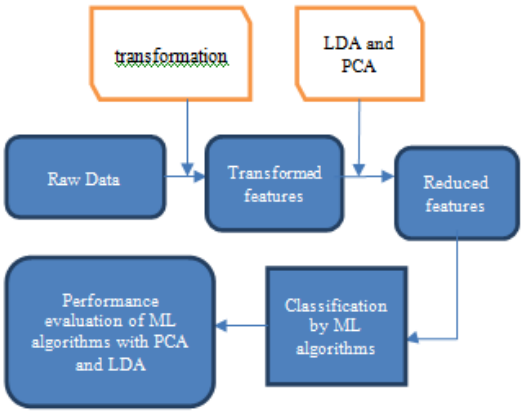

Figure 1 Proposed model based on PCA and LDA dimensionality reduction techniques

RESULTS AND DISCUSSIONS

The experimentation is performed on epileptic seizure recognition dataset, which is publicly available in UCI machine repository [11] using python 3.7.9. A personal laptop with windows 10 operating system and 8GB RAM is used for this experimentation. The original dataset consists of 5 different folders where each one have 100 files and each file represents a single subject/ person. So each file is a recording regarding the brain activity of 23.6 second windows. The corresponding time-series are sampled into 4094 data points. Each data point is the value of the EEG recording at a different point in time. So we have a total of 500 individuals where each one has 4097 data points with 23.5 seconds duration. We divide and shuffle every 4097 data points into 23 chunks where each chunk contains 178 data points for 1 second, and each data point is the value of the EEG recording at a different time point. So now we have 23 x 500 = 11500 pieces of information (rows), each information contains 178 data points of 1 second (columns), the last column represents the label y {1,2,3,4,5}. The attributes information is included in table 1.

Table 1 Important attribute information

Attribute Information

The response variable is y in column 179, the Explanatory variables X1, X2,…X178

y contains the category of the 178-dimensional input vector.

Specifically, y in {1,2,3,4,5}:

5- eyes open, means when they were recording the EEG signal of the brain the patient had their eyes open

4-eyes closed, means when they were recording the EEG signal the patient has their eyes closed

3-Yes, they identify where the region of the tumor was in the brain and recording the EEG activity from the healthy brain area

2-They recorded the EEG from the area where the tumor was located

1-Recording of seizure activity

All subjects falling in classes 2, 3, 4, and 5 are subjects who did not have epileptic seizures. Only subjects in class 1 have epileptic seizures. Our motivation for creating this version of the data was to simplify access to the data via the creation of a .csv version of it. Although there are 5 classes where most authors have done binary classification, namely class 1 (Epileptic seizure) against the rest [12].

Metrics for evaluation of the model

1) Accuracy: It is the percentage of correct predictions that a classifier has made when compared to the actual value of the label in the testing phase [13]. Accuracy can be calculated as below:

   Accuracy = (TN + TP)/(TN+TP+FN+FP)

   Where, TP is true positives, TN is true negatives, FP is false positives, FN is false negatives. In a dataset if the class label of a record is positive, and the classifier predicts the class label for that record as positive, then it is called as true positive. We say true negative if in a dataset the class label of a record is negative, and the classifier predicts the class label for that record as negative. If the class label of a record in a dataset is positive, but the classifier predicts the class label for that record as negative, then it is called as false negative. If the class label of a record in a dataset is negative, but the classifier predicts the class

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label for that record as positive, then it is called as false positive.

2) Sensitivity: It is the percentage of true positives that are correctly identified by the classifier during testing. It is calculated as given below:
TP/(TP + FN)

3) Specificity: It is the percentage of true negatives that are correctly identified by the classifier during testing. It is calculated as given below:
TN/(TN + FP)

Python framework is used to implement the experimentation. It provide mature libraries that can be easily downloaded [14]. Packages like NumPy, Pandas, Scikit-learn, mathplotlib are used. It offers a wide variety of predictive algorithms both supervised and unsupervised, grinds for performing different tasks as well as the calculation of different metrics on the models, dimensionality reduction, pre-processing, visualization, model comparisons such as those used in this paper in a simple and efficient framework to carryout data analysis [15][16].

Performance Evaluation Of Classifiers With PCA And LDA

This section discuss the results obtained from the experimentation. First the dataset without dimensionality reduction is experimented using the following machine learning algorithms: SVM and Random Forest. Table 2, 3 show the confusion matrices for these algorithms. In terms of Precision, Recall and F1-score, the SVM and Random Forest have almost similar performance. There is only a slight difference in accuracy when compare the two ML algorithms without dimensionality reduction.

Table 2 SVM Confusion Matrix

[1821 14]
[36 429]

	Precision	Recall	F1-Score	Support
0	0.98	.99	.99	1835
1	0.97	.92	.94	465
macro avg	.97	.96	.97	2300
weighted avg	.98	.98	.98	2300

Table 3 Random Forest Confusion Matrix

[1817 18]
[28 437]

	precision	recall	f1-score	support
0	.98	.99	.99	1835
1	.96	.94	.95	465
Macro avg	.97	.96	.97	2300
Weighted avg	.98	.98	.98	2300

Accuracy of ML algorithms for the dataset without dimensionality reduction is : for SVM 97.83% and for Random Forest 98.0 %. Sensitivity obtained by random forest is 93.98% and by support vector machine is 92.26%. Specificity obtained by random forest is 99.02% and support vector machine is 99.24%. Figure 2 shows performance evaluation of SVM and Random Forest without dimensionality reduction.

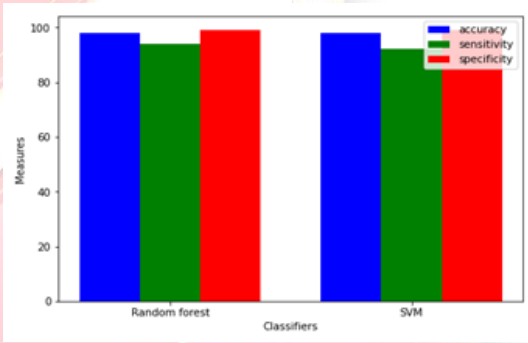

Figure 2 Performance Evaluation Of Classifiers Without Dimensionality Reduction

In the next phase , the dimension of the dataset is reduced using PCA. After reducing the dimensionality of the dataset, the accuracy obtained for SVM is 94.3% and that for random forest is 93.91%, sensitivity for SVM is 77.2% and that for random forest is 81.08%, Specificity for SVM is 98.64% and that for random forest is 97.17%. table 4 and 5 show the SVM-PCA confusion matrix and random forest-PCA confusion matrix respectively.

Table 4 SVM -PCA confusion matrix

[1810 25]
[106 359]

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	precision	recall	F1 score	support
0	.94	.99	.97	1835
1	.93	.77	.85	465
Macro avg	.94	.88	.91	2300
Weighted avg	.94	.94	.94	2300

Table 5 Random Forest -PCA Confusion matrix

[1783 52]

[88 377]

	Precision	recall	F1 score	support
0	.95	.97	.96	1835
1	.88	.81	.84	465
Macro avg	.92	.89	.90	2300
Weighted avg	.94	.94	.94	2300

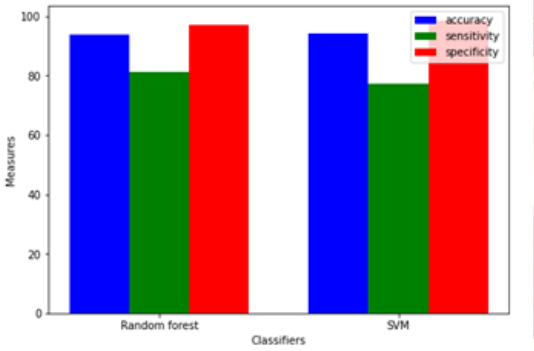

Figure 3 Performance Evaluation Of Classifiers using PCA for dimensionality reduction

In the next phase, the dimension is reduced using Linear Discriminant Analysis (LDA). The number of attributes which were 178 is reduced to 1 using LDA. Then the reduced attributes is evaluated using SVM and Random Forest classifiers. Confusion matrix of SVM and Random Forest is shown in table 6 and 7. The accuracy obtained is 85.43% for Random Forest and 86.09% for SVM. Sensitivity for SVM is 41.26% and that for Random Forest is 50.00% Specificity for SVM is 96.87% and that for Random Forest is 93.96%

Table 6 SVM-LDA confusion matrix

[1796 58]

[262 184]

	Precision	Recall	F1 score	support
0	.87	.97	.92	1854
1	.76	.41	.53	446
Macro avg	.82	.69	.73	2300
Weighted avg	.85	.86	.84	2300

Table 7 Random Forest-LDA confusion matrix

[1742 112]

[223 223]

	Precision	Recall	F1 score	support
0	.89	.94	.91	1854
1	.67	.50	.57	446
Macro avg	.78	.72	.74	2300
Weighted avg	.84	.85	.85	2300

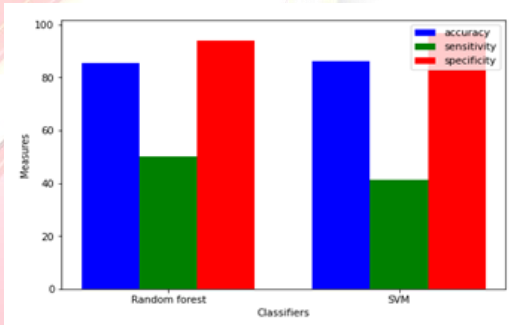

Figure 4 Performance Evaluation Of Classifiers using LDA for dimensionality reduction

I. CONCLUSION

The dimensionality reduction problem is responsible for the process of reducing the dimensions of large feature set into a combined reduced feature set. Advantages of dimensionality reduction problem is computational efficiency and redundancy removing and disadvantages like data losing and feature losing in datasets. In this we used Epileptic seizure recognition dataset provided by UCI machine learning repository. First the performance of algorithms is evaluated with the original dataset, then PCA is applied to reduce dimension. This reduced dimensional data is used to evaluate the performance of the SVM and Random Forest. The observations showed that SVM and Random Forest with and without

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dimensionality reduction have slight effect on performance of algorithms. With dimensionality reduction using PCA we obtain an accuracy of 94.3% for SVM and 93.91% for Random Forest. Then LDA is applied and the observations show that the performance of the classifiers with PCA is better than that of classifiers with LDA.

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FLOOD FORECASTING: AN INTELLIGENT SYSTEM USING MACHINE LEARNING

Sandhya K.S[1], Shejina[2]

[1]PG Student, Department of Computer Science and Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala

[2]Assistant Professor, Department of Computer Science and Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala

Abstract – Floods are natural disasters. They are most commonly caused by excessive precipitation and runoffs which lead the adjoining land areas to be submerged by water which causes huge loss to human lives and properties, which includes damaging buildings, bridges, power supply network and crippling the transportation and bringing economic hardships on the people. In order to decrease the damages caused by the flood, it is essential to implement an intelligent system for the early detection. Over the years, multiple measures have been taken to pre- determine flood warnings which have been implemented using sensor technology and active monitoring of the parameters. This leads to the creation of a wide number of data-sets which can be employed for future purposes. With the availability of data analytics techniques including Machine Learning, the datasets can be directly employed to allow based upon this, and can create a model which helps to predict future outcomes. In this paper, machine learning algorithms like k-nearest neighbor (KNN), decision tree, random forest, and support vector machine (SVM) are used.

Keywords: Flood, Machine learning, K nearest Neighbor, Support vector machine, Decision Tree, Random Forest.

INTRODUCTION

Enormous amount of water is called flood. One of the most challenging and difficult problems in hydrology is forecasting of flood. Flood is a situation in which water becomes uncontrollable. Flood may cause due to many reasons. An increase in the risk of a flood hazard can be caused by several factors, including land use changes such as deforestation and rapid urbanization. Demographic pressures also cause the encroachment of informal settlements on hazardous locations In flood plains. Many other factors are likely to be the root causes of flood disasters. Heavy rainfall is a major factor. Flood is one of the most dangerous natural hazards, responsible for loss of lives and damage to properties. A number of regions are subject to monsoons influences and hence face the disaster almost every year. Forecasting of flood is a difficult procedure. Some of the parameters affecting flood may be amount of rainfall, present river water level, degree of ground saturation, degree of permeable soil etc. In this project, the aim is to prepare appropriate data with correct attributes for the accurate prediction of flood in the regions of India with the help of machine learning techniques. These algorithms are used to train and test the dataset efficiently by using SVM, Random forest, Decision tree and k-nearest neighbor.

MOTIVATION

The use of automated learning, artificial intelligence branch is to analyze and predict chance of flood. In many flood prone regions, flood forecasting is one among the few feasible options to manage floods. In the recent years, reliability of forecasts has increased due to the integration of meteorological and hydrological modeling capabilities. It would improve the data collection through satellite observations, and advancements in knowledge and algorithms for analysis .It can depend subjective data from informative survey. Early flood warning systems using sensor systems, Geographical Information Systems (GIS) etc couldn't identify chances of flood properly. So our developed system can accurately predict the chances of flood more efficiently.

RELATED WORK

A lot of projects have been done for the forecasting of flood. One of the leading technology machine learning can solve this. Related to flood forecasting a research [1] Flood Detection Using Gradient Boost Machine Learning Approach explained Flood Detection mechanism using the Gradient Boost Algorithm which was used to classify the data sets and perform regression on it to produce the best outcomes from the datasets .This approach is developed as Remote Sensing and Sensor. The paper[2] Automated Change Detection in Satellite Images Using Machine Learning Algorithms for Delhi, India analyzed effectiveness of the three types of unsupervised Machine learning algorithms (MLAs) for change detection to detect the change in some of the dominant classes in an urban area, such as, vegetation, built-up and water bodies. Three indices namely Normalized Difference Built- up Index (NDBI), Modified Normalized Difference Water Index (MNDWI) and Modified Soil Adjusted Vegetation Index (MSAVI2) were generated from the Land sat data. Another notable work is done for[3] Flood Forecasting System Based on Integrated Big and Crowd source Data by Using Machine Learning Techniques explained a novel food forecasting system based on fusing meteorological ,hydrological, geospatial, and crud source big data in an adaptive machine learning framework . Forecasting is performed based on these data learned by modern ML strategies. They were decision tree, RF, Naïve Bays, MLP and RBF and ANN, SVM and fuzzy logic. The research on [4] Flood Eye: Real-time Flash Flood Prediction System for Urban Complex Water Flow explained a water-level sensor system that has multiple functions: real-time river-level monitoring and high accurate flood prediction for urban complex water flow (CWF) flooding caused by Localized Heavy Rain. A detection scheme for CWF by developing a water-level sensor system that works in various installation environments using infrared image processing with both low installation and operation cost. Next work on [5] Short-term Water Level Prediction using Different Artificial Intelligent Models explained artificial neural networks (ANN), support vector machine (SVM) and adaptive neuron fuzzy inference system (ANFIS) were selected for comparison. The 1- to 4-hour ahead forecasting based on previous 2-hour inputs is the suggested modeling scenario. One research [6] Developing a Flood Risk Assessment Using Support Vector Machine and Convolution Neural Network: A Conceptual Frame work. It aimed to exploit the data available from the Geographical Information System (GIS) and the technology advancement in the modern world in producing a reliable flood susceptibility and probability map. The next piece of work [7] was Early Flood Risk Assessment using Machine Learning: A Comparative study of SVM, Q-SVM, K- NN and LDA in which classification approaches like Linear Support vector machine, Quadratic Support vector machine, K-nearest neighbor and Linear discriminate analysis were implemented to classify the true positive event of flash floods accurately and precisely. Another notable work was[8]Automatic Detection of Flood Severity Level from Flood Videos using Deep Learning Models developed the use of deep learning models for predicting the severity level of a hooding event captured in videos by the habitats in a hooded region. The model takes the video of a hooding event as input and determines its severity level and create a dataset of food videos then evaluated on this dataset and compared with a baseline convolution neural network (CNN) based model.

PROPOSED SYSTEM

The proposed system explores the use of machine learning algorithms to predict the chances of floods. Figure.1 shows the methodology of proposed system. Rainfall is considered as the primary influencing factor.

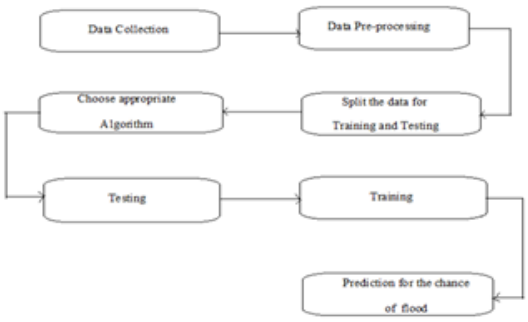

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Fig 1: Methodology of proposed system

Flood prediction detection system consists of the following modules.

A. Data Collection

The aim is to prepare and assemble the rainfall data in various region of India. Mainly rainfall in Kerala. After a thorough study of the flood-prone area, the dataset is prepared and labeled accordingly.

B. Data Pre-Processing

This is the most pivotal step concerning prediction as inconsistent data can give rise to inaccurate results. The data can be obtained from various resources available in big data. The important steps are: Import Libraries Jumpy and Pandas where the libraries imported for processing the dataset. Numpy is the fundamental package for scientific computing with python. Pandas are an open- source high-performance library for data manipulation and analysis. Import dataset is one of the important steps. The prepared data is compiled into a .csv (Comma Separated Values) file and imported using pandas. There will have a chance of missing values .This will lead inaccurate inferences regarding the data. Removal of data with missing values is not an efficient method. Instead of missing values, we are putting null values. There are several factors to consider in the data cleaning process. Elimination of irrelevant data columns, bad labeling of data, same category occurring multiple times. Data cleaning process need carefully consideration because the influence the results.

C. Model selection and prediction

Model selection or algorithm selection phase is the most exciting and the heart of machine learning. It is the phase where select the model which performs best for the data set at hand. Model selection is the process of selecting one final machine learning model from among a collection of candidate machine learning models for a training dataset. Model selection is a process that can be applied both across different types of models .Different kinds of machine learning algorithms are used to predict flood. They are SVM (support vector machine), Random forest, KNN and Decision tree etc.

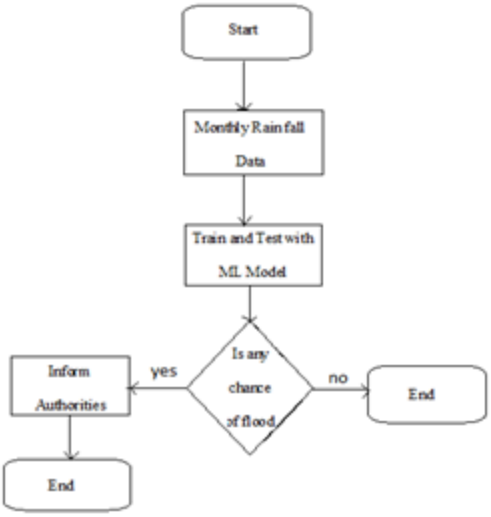


Fig 2:. Flow chart of flood prediction system

MACHINE LEARNING ALGORITHMS

Here we used four types of machine learning algorithms to predict the flood. The ML Algorithms are:

A. SUPPORT VECTOR MACHINE

It is a supervised machine learning algorithm. It can be used for linear and nonlinear classification. It is formally designed by a separative hyperplane.SVM is a representation of data points in space that are mapped so that the data punts of different categories are separated by a gap as wide as possible. Segregate the given data punts in best possible way. During segregation, the distance between the nearest points is known as margine.The hyper plane is selected with maximum possible margined between support vectors?

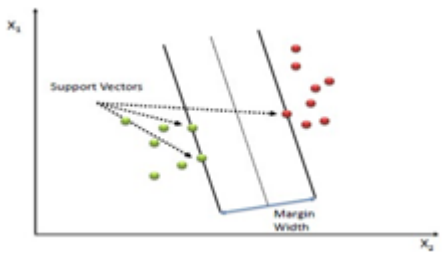


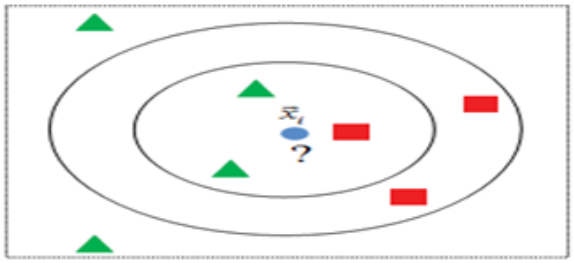
Fig3: Support vectors in SVM

B. K NEAREST NEIGHBOUR

It is a supervised machine learning algorithm. It is mainly used for classification. It classifies data points based on how its neighbors are classified.KNN is based on feature similarity.

In this a new training point is categorteised the higher number of votes of its neighbours.The paramer k which has an important role to get better accuracy. Choosing the right value of k is called parameter tuning. Firstly, we will choose the number of neighbors; next, we will calculate the Euclidean

$$d(x, x') = \sqrt{(x_1 - x_1')^2 + (x_2 - x_2')^2 + \ldots + (x_n - x_n')^2}$$



distance between the data points. The Euclidean distance is the distance between two points.

Fig 4: The basic illustration of KNN classification. If k=3 the test sample (blue circle) is allocated to the group of green triangle and if k = 5 allocated to the group of red.

C. DECISION TREE

Decision Tree Algorithm is a form of supervised algorithm which is used for both classification and regression problems. It is used for both classification and regression problems. Classification is the process of dividing datasets in to different categories or groups by adding label .At the start, every attribute is considered to be the root node for the decision tree. A tree can be built by using these attribute selection measures for every categorical data present.

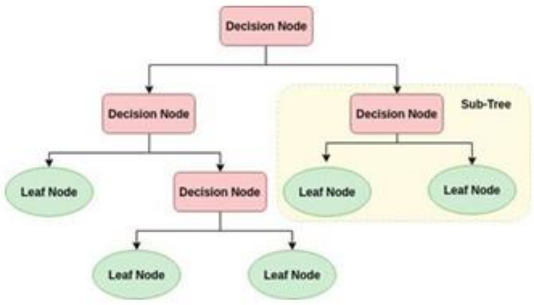


Fig5: classification of nodes

D. RANDOM FOREST

Random forest algorithm is also known as ensemble learning method. It is a supervised learning algorithm. It a collection of many decision trees. It builds multiple decision trees and merges them together. Firstly, random samples are selected from a dataset and a decision tree is constructed for every sample. It is trained with a method called bagging. Combining the learning result from multiple sub trees it would increase the overall result. Vote made by every decision tree. Finally, the prediction with most votes is chosen as the output.

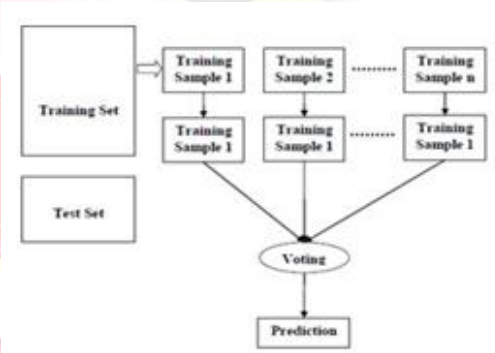


Fig 6: Demonstrates the decision taken by the algorithm based on a cluster of decision trees.

RESULTS & ANALYSIS

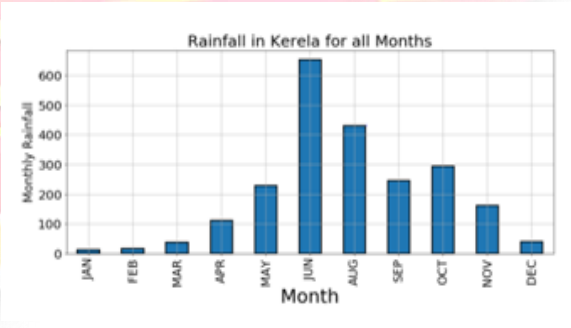


Fig 7: Rainfall in Kerala for all months

Some of the metrics for machine learning models are:

Confusion matrix

a much better way to evaluate the performance of a classifier is to look at the confusion matrix. Each row in a confusion matrix represents an actual class, while each column represents a predicted class, True Positives (TP), True Negatives (TN), False Positives (FP), False Negatives (FN).

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The three main metrics used to evaluate a classification model are accuracy, precision, and recall.

Precision= (TP)/ (TP+FP)

TP is the number of true positives, and FP is the number of false positives.

Recall = (TP) / (TP+FN)

Accuracy= (FN+TP) / (TP+FP+TN+FN)

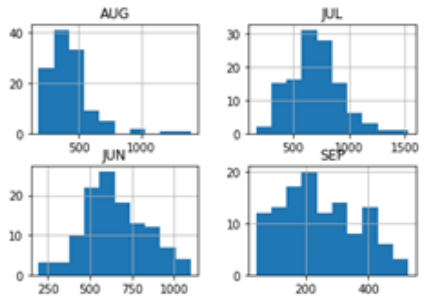

Figure 8: Histogram Representation

Table 1: Accuracy of different algorithms

NO	NAME	SCORE
1	KNN	0.708333
2	SVC	0.791667
3	DECISION TREE	0.583333
4	RANDOM FOREST	0.833333

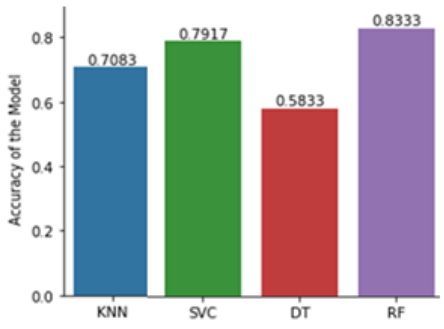

Fig9: Histogram representation Of Accuracy

CONCLUSION

Flood prediction is extremely complex and challenging process. But flood forecasting system helps to predetermine flood events. By developing these systems, meteorological authorities and disaster management teams can control incoming floods, and the evacuation of the affected people to the safer places. The chosen methodology is to evaluate the performance of system in order to determine the most appropriate predictive model. The developed system mainly concentrated the Rainfall data of different regions in India mainly Kerala. This study compares the accuracy score of decision tree, KNN, SVM, and Random Forest for flood prediction. The results of this study indicates that the Random forest which is the most effective machine learning algorithm with accuracy score 83%. In future we can add more parameter to get more accurate result. Machine learning algorithms are used to efficiently predict natural calamities like flood.

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ADSCRIPT

Abijith Mohan[1], Aswin K T[2], George Chakola[3], Jaseeludheen P[4], Hrudya K P[5]
[1,2,3,4]PG Student, Department of Computer Science and Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala
[5]Assistant Professor, Department of Computer Science and Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala

Abstract*—Adscript is a digital marketing platform that connects authors and advocates of content. Digital marketing is growing at a rapid pace around the world, but startups that embrace it frequently fail. This study demonstrates the measures that must be taken in order to effectively utilize digital marketing and realize the enormous potential for increased sales. This study focuses on the evolution of digital marketing and its current significance. The relationship between digital marketing and the Internet sector, as well as the differences and contacts between digital marketing and traditional advertising. The advantages and disadvantages of digital marketing, as well as the future development of digital marketing.

INTRODUCTION

In present scenario, it is really difficult for promoters to find authenticated influencers or content creators to promote their product or enhance their business and brand recognize- tin. Also advertisement programs are available in limited platforms and languages. This is a major problem faced by many entrepreneurs especially for the small scale business who needs to advertise the product/brand in local languages. Everyone uses different transaction methods and all of them are not secured so the transaction must have a proper secured method otherwise it remains less secured. Now days, there is no unique communication platform for sponsors and content creators and it is challenging that either sponsor or content creator to renew the contract and reach already accepted dealers. Smartphone's have undeniably become indispensable. . One potential reason of such popularity is that there are millions of applications available to users. For instance, 2,600,000 apes are available in Google Play Store. Among these apps, more than 90use these apps without paying app developers.

To compensate for their work, app developers have incent- ties to integrate one or more advertisement (or ad) libraries in their app (or host apps), and get paid. Adscript is a contextual advertising program that allows the users to post ads on their website or social media to earn money. This study demonstrates the care that must be taken in order to effectively utilize digital marketing in order to enjoy the huge potential for increased revenue.

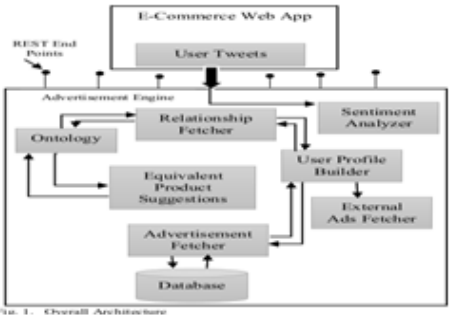
RELATEDWORKS

In the internet age, some old ways have been phased out and others have been improved, while numerous new techniques of product promotion and marketing have emerged. The term"desk research" has been transformed into online research and online market research is now possible. This study of- cusses on the evolution of digital marketing and its current significance. Incorporated .The relationship between digital marketing and the Internet sector, as well as the differences and contacts between digital marketing and traditional advertising. The advantages and disadvantages of digital marketing, as well as the future development of digital marketing. Online advertising has become a global phenomenon that has a significant impact on the retail business. This paper reports evidence that Ad Seeker, User Preference Based Adverb- tenement the use of a social media-based engine to improve the business value of marketing and advertising is a viable option. Because the internet is used by so many people, it necessitates a thorough system for delivering targeted adverts to the correct people. Ad seeker is a tailored advertising system that uses ontological mapping and social media content-based semantic analysis. Using an ontological approach for advertisement classifies- action and identifying personal relationship hierarchy, it is possible to find the best suited advertisement for each user. Ad Seeker

gathers information from users' tweets to determine their preferences. Each user pushed advertisements based on their preferences. We were able to demonstrate that social media profile-based advertising is Effective in giving highly targeted advertisements based on social experiments conducted using Ad seeker. Brand mentioning is a type of word-of-mouth advertising in which social media users reveal a brand name in posts. Because of the strong viral effects on influencers' large fan bases, brand mentions by influencers have recently gotten a lot of attention. The practice of influencers mentioning brands is investigated in this paper. We look at a social network of brand mentions made up of 18,523 Integra influencers and 804,397 brand mention posts. As a result, we discovered four noteworthy findings: I Most influencers only mention a few brands in their posts; (ii) popular influencers tend to only mention popular brands, whereas micro-influencers do not have a preference on brand popularity; (iii) Audiences react similarly to sponsored and non-sponsored posts; and (iv) sponsored brand mentioning posts favor fewer user tags and more hash tags with longer captions to exclusively promote the specific products, as opposed to non-sponsored posts. Furthermore, we propose a neural network-based model that uses network embedding and social media features to classify the sponsorship of posts. The experimental results show that our model achieves an accuracy of 80 to earn money from ad networks, app developers are increasingly integrating advertisement libraries (or ad libraries) into their apps. However, studies have revealed that both ad libraries and ad contents may pose serious security and privacy risks. Ad Capsule, a user-level solution to practically confine advertisements, including ad libraries and ad contents, is proposed in this paper. Because our solution does not require any changes to the Android framework or root access, it can be quickly deployed. We propose the permission sandbox, which isolates ad libraries' permissions from the host app, and the file sandbox, which separates ad libraries' file operations of advertisements from the host app. Outside of this sandbox, the ad library and ad content are unable to read or write any files. Ad Capsule has been implemented as a prototype. Our tests show that Ad Capsule can successfully enforce security restrictions to prevent attempts to access private information or manipulate files in the host app, and that Ad Capsule has a modest performance overhead.

PROPOSED SYSTEM

All content creators and promoters are directly connected in this digital marketing platform, allowing both the sponsor and content producer to discuss and accept authorized offers with ease. This platform uses video-KYC to authenticate the user, which is a trustworthy system that employs AI-enabled technology to aid in fraud protection and error detection. Allows content creators to view and select adverts, as well as reject ads that they don't like or that are in violation of their regulations. For the same time, it assists promoters in locating influencers or content creators in their local area or target location, as well as at a reasonable cost. Because this method allows people to communicate locally, additional languages are offered, which can assist small businesses establish their brands and products. Many high-tech companies have recently experienced stag- nation or decline following rapid growth, owing to the inability to adapt their marketing system structure and operating system, as well as a lack of systems research. This dissertation investigates the components and overall framework of implementation based on past research. The impact of numerous elements on the firm market and marketing activities is referred to as the marketing environ- mint. Without the environment, business would not be able to exist. Because of the properties of the Internet, digital marketing is becoming increasingly convenient in terms of communication and respect for the consumer's choice and attitude. Digital marketing is a type of marketing that promotes products and services via the use of internet and online- based digital technologies and platforms. Adscript is a digital marketing platform that connects content creators with those who want to promote it.



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CONCLUSION

Marketing, physical distribution, and customer service are examples of distribution channels. Choosing the appropriate marketing channels through which to promote their goods. The marketing model chosen will be influenced by the product's qualities. Dealers in the consumer goods business might be retailers, wholesalers, or even re- tailors that sell to wholesalers. Because there is no specific product on display for the service, wholesalers and merchants are not required. Network marketing is an excellent way to build long-term relationships with clients. The internet has provided businesses with a key sales channel for all types of products. This research, we examine sponsored and non- sponsored postings to perform an empirical study to better understand influencers' brand mentioning behavior. We in- vest iGATE the brand mentioning network, which is a social network of influencers and brands linked by brand mentions in paid and earned media. We discovered that the majority of influencers only mention a few businesses in their postings, and that the popularity of influencers affects the pattern of brand mentions. We've also noticed that influencers use longer captions to provide a comprehensive experience as a product recommendation, and they only use one user tag to highlight the brand name in sponsored posts. Furthermore, influencers frequently include brands in non-sponsored posts, regardless of their notoriety. We feel that our findings can help marketers that want to take advantage of social media marketing. Digital marketing is growing at a rapid pace around the world, but startups that embrace it frequently fail. This pro- posed method demonstrates the measures that must be taken in order to effectively utilize digital marketing and realize the enormous potential for increased sales.

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Automatic Visual Feature for Writer Identification: A Deep Learning Approach

Soja M S1, Arathy K J2, Rosemol V M3, Nahala V S4, Miji K Raju5
1,2,3,4UG Student, Department of Computer Science and Engineering, IES College of Engineering, Chittilapilly, Thrissur, Kerala
5Assistant Professor, Department of Computer Science and Engineering, IES College of Engineering, Chittilapilly, Thrissur, Kerala

Abstract – Person identification from his writing is one of the challenging problems. This applications used for forensic analysis, historical documents, and ancient manuscripts. Deep learning process is the best feature extractors from massive amounts of heterogeneous data and provides promising and surprising predictions of patterns as compared with traditional approaches. To identify the writer we apply convolutional neural network (CNN), using handwriting text line images in English languages. We apply evaluation of different freeze layers, CNN (Conv3, Conv4, Conv5, Fc6, Fc7, and fusion of Fc6 and Fc7) affecting the identification rate of the writer. Transfer learning is applied as a pioneer study using Image Net (base data-set) and IAM data-set. To decrease the chance of over fitting, data augmentation techniques are applied like contours, negatives, and sharpness using text line images of target data-set. Sliding window approach makes patches as an input unit to the CNN model. The Resent architecture is used to extract discriminating visual features from multiplicative image patches generated by enhanced pre-processing techniques. Then the extracted features from patches are fed to a support vector machine classifier. Finally we realized the highest accuracy using freeze Conv5 layer up to 92.78% on English

INTRODUCTION

Handwriting plays a key role in presentation of learned behavior of the person. It is the main identity of a person. Writer identification has got keen interest by researchers in the field of bio-metrics and forensic sciences. Automatic writer identification is determining and identifying whether the given hand writing is t1ruly matched and assigned to the claimed writer of handwriting. The writer identification system finds the handwriting to specific and true writer out of number of Writers. This system can be classified with mode of capturing data such as online and offline. The former case deals, the spatial coordinate's values while the latter case deals with temporal information. Offline writer identification can also be classified with respect to textual content such as text dependent and text independent. The text independent method require input image with fixed text content and measures similarity of the input with registered templates for identification. We need to extract the discriminating features from handwritten text for the identification of writer. Features can be extracted implicitly or explicitly. The manual feature extraction as it requires human expertise and domain Knowledge to extract and select the discriminating set of features; it is one of the difficult tasks. Manual features are language dependent. Automatic features learned by deep neural networks outperformed as compare to hand crafted features. The automatic features are extracted by deep learning based models automatically from the raw data of images directly. The features are not dependent on language or patterns. So, this can easily investigate different models on the given data-set, no need of domain knowledge and expertise in the language or patterns. The challenges of the writer identification process include the use of different pens, which changes a person's writing style, the physical condition of the writer, distractions like multitasking and the noise that changes the styles of writing with age. The changes in styles with increasing age is not covered by any available dataset and cannot be examined, but makes the identification or retrieval harder for real life data.

RELATED WORK

Finding the author of specific text by comparing it to documents in a database where writers are known is called writer identification, where the task of finding similar

handwritings or all documents of a specific writer is called retrieval. This method is performed by using Convolution Neural Networks (CNN) to generate a feature vector for each writer, which is then compared with the pre-calculated feature vectors stored in the database. The Convolution Neural Network is trained on a database with writers whose writing is known and after training, the classification layer is cut-off and for feature vector, fully connected layer is used in the output of the second last. For the identification a nearest neighborhood classification is used. CNN have great success in supervised classification tasks like character classification or dating. Deep learning methods need plenty of annotated training data, which may not be available in many scenarios. In such cases, traditional methods are way better than or like deep learning methods. It's a simple and effective because of learn CNN activation features in an unsupervised manner. So, it trains a deep residual network using surrogate classes. By clustering the training dataset we'll create these surrogate classes, where each cluster index represents only one surrogate class. All the activations from the penultimate CNN layer function features for subsequent classification tasks. It evaluates the feature representations on two available datasets. All the focuses are lies only on the ICDAR17 competition dataset on historical paper writer identification (Historical-WI). Here the activation features are superior to descriptors of writer identification methods and are trained without supervision. And also it's ready to do comparable results in handwriting classification using ICFHR16 competition dataset on historical Latin script types (CLaMM16). In writer identification for offline Japanese handwritten character using CNN, some kind of features from Convolution neural network (CNN) for writer identification are proposed. It use dataset of Japanese handwritten character, this consists of 100 kinds of words from 100 different writers. It evaluates two nature of handwritten words, first one is the potential of writer identification for each word in Japanese and second one is handwritten words contain the writer own unique identities. These natures cause a variation in accuracy of classification about each handwritten character and about each writer for same word. Difference of accuracy is approximately 90% for the former and the accuracy has large influence by the feature of each word from CNN. Difference of accuracy is about 60% for the latter and unique writer style can be used to determine authorship of a handwritten document.98.01% out of 301 writers with input of only 4 English alphabets...

PROPOSED SYSTEM

The proposed identification techniques deploy the pre-trained Resent architecture of CNN on multiple representations of patches of text-lines images. The network is trained using the features extracted from freeze/fixed layers of Resent architecture. The overall pipeline encompasses of three main steps: pre-processing, feature extraction and classification. The pre-processing steps involved in this study are skew detection, skew correction, normalization and segmentation.

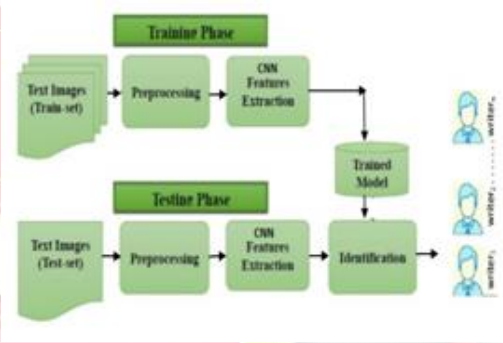

Fig.1. Architecture Diagram

Overlapped sliding window strategy is then employed to extract patches from text line images of English and Arabic languages. Data augmentation proved itself as a successful mechanism in the field of deep machine learning approaches for expanding training data which result in promising classification results. To produce the enormous amount of data For the deep model, unlike traditional techniques of data augmentation is applied like contours, negatives and sharpness. The pre-trained Resent architecture of CNN is employed to extract discriminating visual features from multiple representations of image patches. The IAM Handwriting Database was first published at the ICDAR 1999. It contains 1539 pages of handwritten text from 657 writers who provide a different amount of pages and also provide labeled text lines and labeled words using automatic segmentation and are manually verified. Since the number of

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pages of each writer ranges from 1 to 58 pages in the original database.

PRE-PROCESSING

Pre-processing is the first step in pattern recognition and digital image processing. In this step, irrelevant information is removed from the data. The input images are transformed to a form which is appropriate for further processing. Pre-processing steps involve skew detection and correction, normalization, segmentation, sliding window strategy for patches, contours extraction, computation of sharp images and negatives.

SKEW DETECTION

Skew is introduced in images due to improper scanning. Skew detection and correction is the process of identifying the skew angle and then correcting that angle. Skew in the document images introduce difficulties in segmentation process so it needs to be corrected in pre-processing step.

SEGMENTATION

Segmentation divides an image into disjoint regions such that pixels within a region share some common attributes. The text of a paragraph is segmented into lines, in the segmentation step. The numerous methods that work robustly in order to classify the information as text or graphics in an image of a document. However, there is English text line segmentation. In the segmentation process, all handwritten images may require a re-sampling to a predefined size. This normalization is carried out in a way as to preserve the aspect ratio of the image. For this purpose, the image width is adjusting to a default value-adjusted and the height will change without any change on height-to-width ratio. Handwritten images of IAM are normalized to the width of 1250 pixels and the aspect ratio is kept maintained with respect to height. Then convolved the images with hamming window of size 80 and compute horizontal projection profile. The resultant segmented lines corrections are depicted after skew detection.

SLIDING PATCHES

In order to extract the patterns that a writer employs frequently as he writes, so first need to carry out segmentation of writing into small sub-images (patches/fragments). Before proceeding to the analysis of small writing fragments, the document images are converted into grey scale resolution. Although the images of IAM might carry additional information e.g., pen pressure, different inks etc. We choose to work on the grey scale images which simplify the representation and comparison of two handwriting forms. Patches extraction is needed because here deployed a CNN ResNet that is a deep learner and require a large number of annotated data for the best results. It is to be noted that paragraphs or lines is not a sufficient data for the ResNet. Thus, divide the lines into the patches of size 227×227. 227×227 windows are slide on text line from left to right and top to bottom while considering English texte*d. AUTOMATIC*

FEATURE EXTRACTION

After pre-processing, the next step is feature extraction. It is one of the most significant step of any research domain in machine learning. In this approach, deploy ResNet architecture of CNN to extract the learned freeze activation features. It is the easiest and fastest way to use the representational power of pre-trained deep network i.e. Resnet architecture of CNN. The deep-convolutional neural network (ResNet 50) architecture adopted is shown in fig. The network contains an input layer which takes grayscale images of resolution 1000 x 1000 pixels as input. Then there comes 3-set-combination of Convolution.

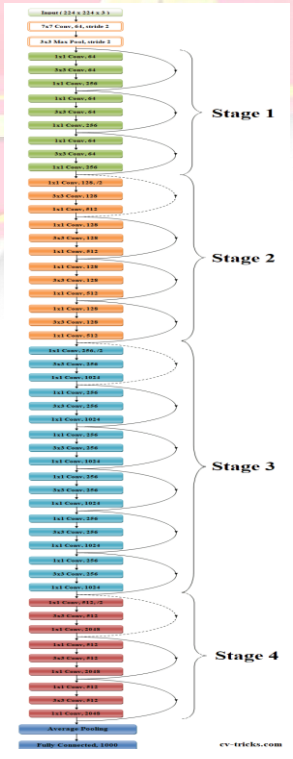

Fig.2.ResNet 50 Architecture Diagram

It consists of Convolution Layer, a ReLU (Rectified Linear Unit) layer and a Max-Pooling Layer. Finally, the set of feature maps obtained after the 3 sets are flattened or unrolled into a single feature vector in the Flattening Layer. Then the single feature vector is fed into an Artificial Neural Network which forms the Dense Layer of the Convolution Neural Network.

CONCLUTION

Automatic author identification is extremely intriguing analysis drawback within the field of document analysis and handwriting recognition. The effective implementation of author identification systems may be applicable in rhetorical and historical analysis, banks, check process, signature analysis, graphology, legal documents, ancient manuscripts, digital rights administration, and document analysis ways. The target of study is to explore the visual patterns for automatic author identification from at liberty offline scanned text-lines pictures of handwriting. So, conferred a pioneer study for author identification and authentication in written documents victimisation IAM data-set. This approach used pre-trained CNN model named as ResNet design victimisation freeze layers. The options are extracted from base data-set named as Image internet and so transferred the learned freeze options for classification victimisation target data-set named as IAM data-set.

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SKY BUS TECHNOLOGY

Nidhin M R[1], Athulya Varghese[2], Athira Rajan[3]
[1,2,3]PG Student, Department of Civil Engineering, IES college of Engineering, Chittilappilly, Thrissur, Kerala, India.

Abstract – The Sky Bus technology offered by the Konkan Railway Corporation meets the above requirements and redefines the thinking and planning for urban transport as a revolutionary eco-friendly heart mass urban transport system for city life. It is a patented technology developed for the new millennium, which will lead to a paradigm shift in urban transport around the world. As an indigenous technology, it will put India at the forefront of the fast transit industry around the world and provide the necessary alternative transportation solution that is economically viable, environmentally friendly and integrates with proven existing technologies. Sky bus uses state-of-the-art pre-fabricated construction technologies that save time and money for easy implementation of the project in congested urban areas without disturbing the existing traffic pattern. All of these structural engineering methods are well proven. They have IT tools for financial communication and control. The 3 phase asynchronous AC electric motor used for propulsion of Sky buses is widely used abroad and in India.

Keywords:-sky way, sky bogies, sky coaches, sky stations

INTRODUCTION

The Sky bus project was conceived while examining the deplorable road conditions created by the metro infrastructure installed on wide roads, which has caused a lot of difficulties and delays, causing traffic jams for everyday road users. The concept of the metro seems to shine brightly on the surface for traffic jams in the city and for managing the movement of large people from one area of the city to the other, while in fact car owners will not evaporate the public transport bus system run by the government during the opening of the metro. The government may reduce the number of buses on the proposed routes to accommodate the metro. While private car owners may not want to partake in their private cars for Any reason, traffic congestion on metro routes is not significantly reduced. At the same time, the installation and commissioning of the metro destroyed the road space by placing pillars along the road to run the metro overhead on the elevated platform. This idea of eliminating road space will create narrow spaces on major roads for car and bus use in all situations. Many metropolitan residents would not have bought individual four-wheelers if the metro had been installed at least a decade ago. With this in mind, we planned to build a system that would provide additional road facilities to improve the space erosion traffic conditions and provide alternative transportation as a metro through the Mask Rapid Transport System. In addition to the introduction of metro-type transportation systems, such systems have been successfully implemented in some countries where roads have been added. In high-density metropolitan cities in Southeast Asian countries, these systems are called sky buses or air buses.

COMPONENTS OF SKY BUS

System Sky Bus Metro contains some of the most traditional and proven technologies that make Sky Bus more efficient. Sky bus, along with other luxury amenities not available on local buses or trains, is designed to provide seamless and ultimate comfort to passengers. These are the various key components of this system. Skyway, sky bogies, sky coaches, sky stations, traverses arrangement. The Skyway has an 8.4 x2.4 m concrete box structure 9-10 m higher than the existing road level. Pilot ions support 1 m diameter columns 15-25 m apart along the roadway in the middle of the roadway. The sky bogie is guided by two rails fastened with appropriate fasteners inside the concrete box. In addition, the closed concrete box includes adequate sidewalks on both sides of the tracks so people can walk on the closed concrete box for

inspection and maintenance. The top of the closed concrete box, which runs continuously in rows, can be used innovatively for a strip park or other appropriate use that is Open to pedestrians. Concrete columns can be installed 15 meters or less, depending on the street conditions and the curvature of the sky in urban areas. Street conditions such as bridges and similar joint development opportunities, such as minimum clearance, also determine the height of the skyway. Standard two-axle bogies can be used on metros at speeds of up to 100 km / h (but higher speeds can be achieved and standard gauge up to 160 km / h is required. Linear induction motor technology incorporates a fourth rail drive above the bogie and 3 renewable 3 phase AC motors. The third rail is used for the current collection. Emergency mechanical brakes are also provided. They are also a reproductive type. Sky coaches were suspended from bogies. Each coach is designed for 10 people to carry 150 passengers. Sky buses can be formed with 2, 4 and 6 coaches, resulting in a bus carrying up to 300, 600 and 900 passengers respectively. Within 40 seconds (time between continuous trains), the directional capacity is 27,000 to 81,000 passengers per hour. At one minute on the highway, the directional capacity is 18,000 to 54,000 passengers per hour. This capacity is sufficient in the urban areas of many developing countries. The coaches are made of double-walled light shells with large windows. They can even negotiate curves up to 100 meters under regulated banking. Each coach is provided with 4m wide sliding automatic doors. The width of the doors is estimated to be enough to empty a fully loaded coach (150 passengers) and fill it to its full capacity within 20 seconds. Depending on the transit function of the system, such as short shuttle operation and line whole operation, the interiors of air-conditioned coaches can be designed to have a better mix of sitting and standing passengers. Coaches are equipped with audio-visual equipment to enable communication with the occupants of the car. Indian Railways' Integral Coach Factory (ICF) manufactures and distributes 35,000 coaches. With a production capacity of 1000 coaches per annum, it exports coaches to developing countries. Unlike traditional mass transit systems, the Sky Bus requires smaller stations up to 50 meters in length. Stations are available every 1 km. This is a natural footbridge across the road. The station provides natural access from the top line to the bottom, which is easy. The service is provided every 2-3 minutes so that passengers do not have to wait. Fully automated without drivers or guards and access control by swiping prepaid cards are also electronic. Station access only works as a convenience, not as a passenger holding area. Since all the rural towns are located at a high level, the stations are elevated from the ground level and easily accessible to the mountainous area. The stations are designed using 18-meter-long platforms for 2-car trains. Automatic fair collection system can be set up at stations using prepaid card swiping system. Elevated stations can be connected to the road level via staircase and / or elevators. Stations can be incorporated into independent or other buildings such as railway stations, hotels and shopping centers for better access through joint development opportunities. The stations are designed to be simple and functional. Indian Railways is well versed in the design, operation and maintenance of such stations.

3. TRAVERSER ARRANGEMENTS

An innovative feature called Traverse has been developed to move bogies from one track to another or to a track leading to a maintenance facility without the use of switches and siding, a feature that automatically transfers Sky bus trains from one track to another.Traverser is based on the experience of proven load movement technology used on large construction workshop floors. No points or crossings.

4. FEATURES OF SKY BUS

60 kg rails are fitted with double elastic fastening, standard gauge 1435 mm. Sleepers are designed and tested with a load on the 20 ton axis, resulting in a maintenance-free track. 100 km standard gauge 12 ton / 14 ton axle load powered bogies with similar features used in the case of metro rails with 4x110 / 115 kW asynchronous 3 phase motors. Second acceleration braking is an electrical regenerative type that includes compressed air disc mechanical brakes and emergency / passive mechanical brakes for stabilization. Crushing loads of more than 70 tons can be carried under the frame. Each train unit is 20 m long and consists of two driving bogies - the coast is divided into 2x9.5 m long buses. Size 3.25m x 9.5 with two compartments each Sky bus unit can carry up to 300 people at

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a time the train is 3 units with a length of 20 meters and a length of 60 meters with a capacity of 1200 people. A simple three-point signal system is used here, in this case, three lights arranged vertically for each signal. The top one is green, the center is yellow and the bottom is red. The red and green lights show the same indications as in the two viewing system and the yellow light shows the alert sign. The signal is guided by a motorman's line of sight, with an additional unique security layer of the shield that is capable of advancing for 40 seconds but planned for 60 seconds. The 60-second Sky Bus Route can be designed to carry 20,000 to 70,000 passengers per hour in each direction during peak periods. Sky bus automatically controls a continuous computerized central monitoring & control system, providing audio / visual access to each coach for safety. Repetitive intelligence systems to provide protection against wind loads / emergency localized control / overloading prevention / emergency evacuation guidance. Coaches can never escape from the guidance system and tracks and therefore avoid accidents. In contrast to Sky buses at terminal points, tracks are changed or taken to depots by traverses — Sky bus units include mechanical auto-drive systems capable of handling up to 60 meters The stations are 60 meters long to handle three units of sky bus, covering the requirements for the next 25 years - initially only 20 meters is required. Access is from existing footpaths, limited to 6 meters for commuters - 500 to 600 meters wherever you are on the road with the Sky Bus Route. It can be designed for a turning distance of 20 meters and a vertical lift if required - thus avoiding the complete demolition of any built-in urban property if required. Maintenance is through continuous monitoring of vibration signatures, and the need is automatically guided by computerized and periodic inspections. All subsystems and components are subject to the existing UIC / Indian Railway Code system applicable to railway transport. The cargo of standard containers is automatically delivered to and from the city. It carries the international class safety certification of world-renowned security certifiers. The current concept of the railway terminal has been replaced by this “grid” system, with 15 multi-point distribution discharges and access - almost eliminating intermodal transmission. Each station, designed to handle passengers, can reach the 4m wide footpath - less than a minute waiting time. The layout along the route is usually located on the average of the road (approximately 15 m apart in 1.2 m diameter columns), the road requires a proper lane at a height of 6.5 m, and the fixed structure carrying the railway tracks is located at 11 m - thus eliminating the effect for road users. Normal road width is 10 m and at station locations, 20 m width is preferred for 60 m length. The depots will be located outside the urban areas and will require 25 hectares of land for every 10 km of route. The stations are located with access from existing footpaths and above existing roads, not longer than 60 meters to meet the city’s next 100-year requirements — practically requiring little land. Normally in tropical climates, for a module of 10 km route, all services including 15 MW power cover traction and comfort air conditioning loads at stations are required. Walking distance of 500 to 700 m, air-conditioned travel at speeds of up to 100 kmph, service is available in less than a minute during peak hours, reduced to Rs 1.5 per km, and for regular journeys with a lead of more than 7 km. Normal installation to handle peak load of 40,000 passengers per hour, dual line, turnkey based cost Rs. 55 to 60 sec. One kilometer and a construction period of less than 10 years, for a module of at least 10 km route.

5. GRAVITY POWER TOWER

Sky Bus is based on the Gravity Power Tower (GTP) principle. Gravity power tower towers are networked microprocessors with a main gear system, high speed power transmission cable, and rolling unit as well as nearby gravity power controllers.

5.1. THE GRAVITY POWERED RAIL MODULE

In this case there are no electric motors, flywheel energy storage is only a secondary component, to receive energy from the moving rolling unit, drive a dynamo to provide emergency lighting or siren as needed. A pair of solid rubber wheel sets attached to the extensible arms prevents derailment, which usually does not touch the sidewalls, but extends to the sidewalls when the pre-determined acceleration limits are reached or instructed by the rolling unit controller. A compressed air cylinder is powered by the brakes to prevent derailment or escape from the rails and to cause disc brakes to build up. The steel wheel of the rail module is similar to that

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used on railroads, passing through the standard rail track; there is an opening in the middle of the track to accommodate the downstairs space frame that spans the two bogies. The rail module is very simple without conventional traction motors or conventional braking settings. The cargo container or passenger coach is integrated with the space frame of the rail module, which is spread over two bogies. The system can be raised or sub-way suspended coach type. The movement is fully controlled by energy management and keeps the power cable continuously positive and automated without visible signals. Safety is enhanced by protection against derailment and capsizing of coaches, as the coaches are indistinguishable from the tracks inside the enclosure box, for the higher and underground options of gravity power rail-suspended systems. The power supply fails and the train moves away from the station, because the launch will not take place unless the Gravity Power Tower has enough energy to launch a coach that has been suspended to reach the next station. There is no risk of burning fuel or electric sparks or short circuits in the coaches' journey, reducing the risk of fire and eliminating pollution. Positive control over the launch and reception of power transmission cables ensures the safety of moving coaches and automatically controls the computerized control of gravity power, eliminating common train signal control systems in the Gravity Powered Rail system. On the board computer of the rolling mass. Access lifts and emergency exit stages can be taken care of, and adequate conditions can be created for safe transportation, disaster prevention and mitigation, as in the case of existing metro systems. The biggest advantage is that the road grades can be tracked as the rail-based system does not rely on rail-wheel addition for tragic effort. Since the roadway does not exist, the system can be implemented without delay, and it is pollution-free, environmentally friendly and as reliable as gravity. Now the cost and impact of a country's energy sector. Take the USA as an example. For every megawatt of gravity delivered by the Gravity Power Tower, we need 10 to 30% of the electricity to recover. Depending on the source of electricity, these costs will vary. The basic operating cost of providing a Gravity Tower is relatively low. Thus the impact of a country's energy sector is, in the case of the USA, far removed from the tower using high speed power transmission cables; 19 The Gravity Tower, which recovers the energy of the Power Mass module, raises the mass against gravity, 98 to 70% energy, depending on the kinetic energy of another rolling mass approaching through high speed power transmission cables; Balance amount from external power source; a network of such gravity power towers with high-speed power transmission cables connected to each other by rail / road or airway generates gravitational power transport systems that save more than 70 percent of the energy used in transportation. Compared to electricity, gravity enjoys the added feature of profit on production and distribution costs. At a speed of 108 km / h, urban traffic stops at 450 m / s, which proves to be fully powered by gravity power, which requires less than 2% of electricity.

6. SAFTEY FEATURES

Listed below are a number of safety features developed as technological initiatives for the operation of the Konkan Railway and the latest developments specifically made for SBM.

6.1. DERAILMENT ARRESTERS

Dormitory arresters are fitted in the bogies. Dryment arresters, rigid rubber wheels, are connected to 20 journals of the bogie wheel sets (within the concrete structure) with a gap of 15 mm to 20 mm between the rubber wheels and the concrete surface of the box top. Under normal operating conditions, these rubber wheels of derailment arresters do not touch the inner roof of the concrete box that holds the gap. When the running wheel of a bogie leaves the railway (i.e., when the running wheel climbs or the wheel derails on the axle); before clearing the railway top, the rubber wheel of the derailment arrester attached to the top of the faulty bogie wheel touches the bottom of the roof inside the box. Touching the rubber wheel of the derailleur arrestor to the bottom of the roof of the concrete box forces the control computers to control the speed and run of the train. The faulty running wheel will be taken back to the rail guide in the process and the rail guide will not be allowed to deviate, thus avoiding rail misalignment. The bogie, if damaged, can be removed in the next traverser.

6.2. SWING ARRESTERS

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The suspender rod, which connects the cars moving under the concrete box to the bogies operating inside the box on the rails, moves even though two parallel slots are provided in a row on the floor of the box. The hinge or pivot mechanism of the suspender rods is allowed to change to a limited extent when discussing curves and under normal lateral wind forces. To minimize swing beyond acceptable limits, swing arresters are attached to the suspensions. Swing arresters, which are solid rubber wheels, are attached to the suspensions, leaving a gap between the rubber wheels and the bottom surface of the concrete box. The works of these swing arresters are similar to those of derivation arresters. When the swing exceeds the allowable limit, the rubber wheel touches the concrete surface, initiating corrective action to control the swing by slowing down or stopping the system.

6.3. Anti-collision device (ACD) network

KRCL has developed an extensive ACD network for intercity rail operations. SBM technology uses the concept of the ACD network. The ACD Network is an intelligent microprocessor-based device with a central processing unit and a global positioning system with digital radio modern communication system the components of the ACD network are located at the front and end coaches and stations of each train. All these components of the ACD network exchange information between them and make decisions to prevent collisions automatically. SBM has an ACD network and bogie-mounted disk, regenerative and mechanical brakes to prevent collisions. Even if all of these systems fail, the under frames of the bogies operating on the overhead concrete box will take the impact of the collision. Passenger coaches hanging from bogies are subject to longitudinal direction, the intensity of which depends on the intensity of the collision.

6.4. EMERGENCY EVACUATION OF PASSENGER COACHES

Electrical equipment, driving motors, and other sources of fire are located in the overhead concrete box away from the passenger coaches. Any fire associated with electrical equipment is controlled in a concrete box. If there is any smoke, it will rise and fall from the occupants of the cars, thus avoiding suffocation, which is the leading cause of death in transit cars. If a passenger car is evacuated, it cannot be driven. The nearest station for emergency evacuation has the following additional facilities for immediate replacement of passenger coaches. Bring another passenger coach on another track and transfer passengers from the problematic coach to that car via extension walkways connecting the two 22 coaches. Use emergency sliding chutes, as in an airplane, and move the assigned passengers to the ground on either side of each passenger coach.

7. ADVANTAGES OF SKY BUS

With this new technology of Sky Bus, almost no land acquisition is required except for providing the right route on the existing roads. At terminal points, an area of about 2000 to 4000 square meters is required, even in places far from the city center. No demolition of structures or destruction of gardens. No destruction. Stone throwers are not at risk. Track inaccessible. Faster removal in case of fire compared to underground metros. If the rail derails and cannot fall down, the coach hangs. So capsizing is not done as compared to railways and underground metros. No deaths due to trespassing or falling off a train. On normal metros like Mumbai, 2 to 3 deaths occur daily. The total number of mobs reaches 2,000 each year. The sky bus follows the existing busy roads, thus disconnecting the roads in the heart of the city. This is not possible in the case of ordinary railways. Capital expenditure is the lowest. Approximately 50 percent of the elevated systems and 25 percent of the underground metro require the same level of performance. It has the lowest operating cost. The Sky Bus has maintenance free tracks and no signals, points or crossings to maintain. Sky bus does not interfere with normal road traffic. It does not require a road above or below the bridges. As the system contains aerial guides that are not included in the exact definition of railways, the number of agencies involved in clearing and implementing the project will be minimal and only one authority will be created at the state level to implement the project. It can be built on roads with flyovers. That is not an obstacle. The project can be commissioned within 2 years from the date of completion of the financial closure. The sky bus ride is aesthetically pleasing and noise free. The sky bus is insulated against flooding, rain and obstruction on the track.

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8. SKY BUS METRO RAIL LINKING HIMALAYA REGION

In June 2013, a multi-day cloud cover centered in the northern Indian state of Uttarakhand caused catastrophic floods and landslides in the country, the worst natural disaster since the 2004 tsunami. Heavy rains lashed parts of Himachal Pradesh, Haryana, Delhi and Uttar Pradesh in India, parts of western Nepal and parts of western Tibet, but 96% of accidents occurred in Uttarakhand. As of July 16, 2013, the Uttarakhand government estimates that more than 5,700 people have died. This includes 934 locals. The Indian Air Force, Indian Army, paramilitaries and NDRF team evacuated more than 110,000 people from the floods. Similarly, heavy rains on September 3, 2014 raised the threat of floods across the valley on Wednesday for the second day in a row in Jammu and Kashmir and other countries including the summer capital Srinagar. The water level in Chenab, Umlam and other major rivers and streams in the state rose overnight. Extreme levels of flood danger were announced in at least two places in south Kashmir. Heavy rains inundated many parts of Srinagar on Wednesday, disrupting normal life across the summer capital. People alleged that the district administration had failed to address the situation prevailing due to continuous rains. The city of Srinagar witnessed traffic jams throughout the day, giving people a difficult time. More than 250 people have been killed and thousands trapped across the state, including Srinagar. The Army, Air Force and NDRF carry out a large rescue and relief operation consisting of 86 aircraft and 30,000 troops. . If we had built a sky bus in this area, the rate of damage to life would have been reduced. A rapid transit system such as a sky bus can be built between the valleys and the distance by road can be halved. The layout of the sky bus route should be chosen in such a way as to cover the maximum number of cities in the mountainous region, whether it is located on land or on rivers. The sky bus failed in the metro city, but it will be a success in the mountains. It can be used as a disaster relief in evacuation of people from the area, as roads and bridges are damaged in the disaster prone area.

CONCLUSION

Sky Bus is a technological breakthrough achieved by India. Sky bus is an improved railway technology that eliminates the problems of existing metro rail systems, derailment collisions and the capture of broken people - the misery the country has been experiencing for decades. Financially the school bus metro city transportation dream comes true for administrators and people. Sky Bus Metro is the only technology that can change the face of our cities, bring out the 10 million road vehicles in the cities, revitalize cities, raise living standards, attract and sustain economic activity to create wealth.

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REVERSE ENGINEERING USING 3D PRINTER

JOSEPH GEORGE[1], AKHIL DAVIS[2], KALPAK THOMAS[3], SOURAV S[4], VYSAKH MOHAN[5]

[1]Assistant Professor, Department of Mechanical Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala, India

[2,3,4,5]UG Student, Department of Mechanical Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala, India

Abstract – Despite the rapid advancement of technology, the general notion of mechanical devices has remained unchanged. Gears, which have a wide range of applications, are still the most prevalent component of these devices. For the rebuilding of gears and mechanisms, there are both technological and historical issues. This is especially true when it comes to replacement parts for technological equipment that aren't readily available on the market or when service fees are prohibitively high. Reverse Engineering is a modern reconstruction technique that uses technologies to change an existing object into a final genuine product using a virtual model. Modern industrial engineering is built on cutting-edge CAD (Computer Aided Design) technology. CAM – Computer Aided Manufacturing – is a combination of designed design methodologies and computer-aided manufacturing technologies. The rapid growth of 3D CAD systems has resulted in the creation of solutions for obtaining the planned object, which are currently in the development stage. The Rapid Prototyping approach, for example, is meant for the fast, precise, and repeatable manufacturing of machine components. The widespread usage of additive printing, as well as the growing interest in it, encouraged its evolution. The objective of this essay is to demonstrate how the Reverse Engineering approach and 3D printing may be used to reconstruct gears. The real gear, which has been recreated using reverse engineering and 3D printing, is the subject of the study. The main assumptions of the procedures employed, as well as the technique for doing reconstruction work, are presented in this article.

INTRODUCTION

Reverse engineering (RE) procedures are an integral aspect of the prototype development process. Big corporations are Investing in RE to improve their competitiveness, reduce the time it takes to create prototypes, and reduce the time it takes to produce finished products. There are numerous reasons to use RE. The absence of a digital 3D CAD model is the primary condition for selecting RE as a creation method. RE'S application options are expanding in lockstep with hardware and software development. This is utilized in the construction and design of things. Real-world product digitization, CAD model comparison with produced product, and machine settings via CAM systems following digital measurement are all examples of how these approaches might be used. In the automotive sector, reverse engineering is used a crucial component of the car-making process the design department of an automobile makes the most use of 3D scanners. Transferring a physical designer's automobile model into a 3D CAD model without 3D scanning would be time-consuming and complex. With the use of 3D scanner technologies, this process can be reduced to a bare minimum, and the designer may focus on other things. The traditional machine method starts with a CAD model. It all starts with component production and finishes with component production. The RE procedure is the polar opposite. The physical component comes first, followed by the digital model (fig.1). One of the various ways to use RE in production is to use it for service operations. When a gadget malfunctions, the standard service procedure is to try to repair it as quickly as possible, or Replacement of a damaged component. When there aren't any spare parts, however, part replacement can take some time. Using RE and rapid prototyping to reduce repair time to a bare minimum is an unacceptable option.

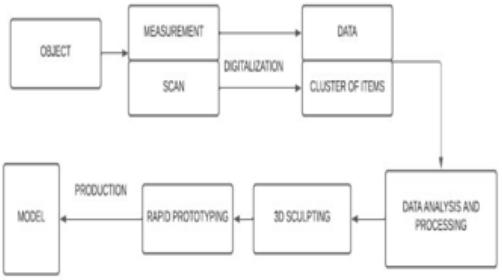

Fig.1: Steps involved in working of 3d printer

SCOPE OF THE PAPER

3D printing technology has been utilized in a wide variety of industries. Figure 2 depicts the many types.3D printing has a variety of applications, including research, artistic products, visual aids, presentation models, and device manufacturing Covers, bespoke parts, functioning models, patterns, and series production are all available.

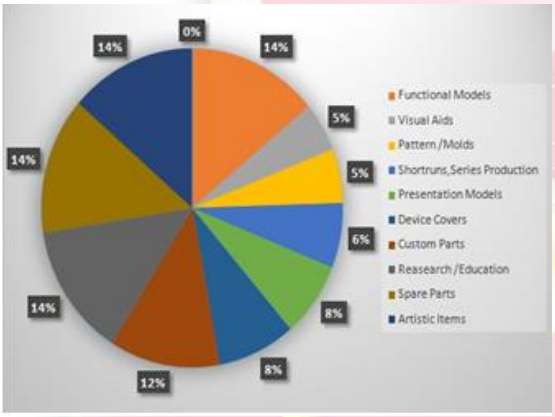

Fig.2: 3D printing applications in various fields

METHODOLOGY

We're recreating the worn-out gear in this endeavor. It can be built in-house, thus all processes from design to fast prototyping will be required. The technique is broken down into parts that will help you comprehend the various stages of reverse engineering. Understanding the situation is the first step. Scanning technology is used to first determine the part geometry. The three-dimensional image of the broken impeller is then created using various software. The part is then optimized using ANSYS software once the image has been obtained. Following the optimization, Rapid prototyping machine is used to obtain the geometry and pattern of the part technique for reverse engineering. This can be utilized for the original part's casting.

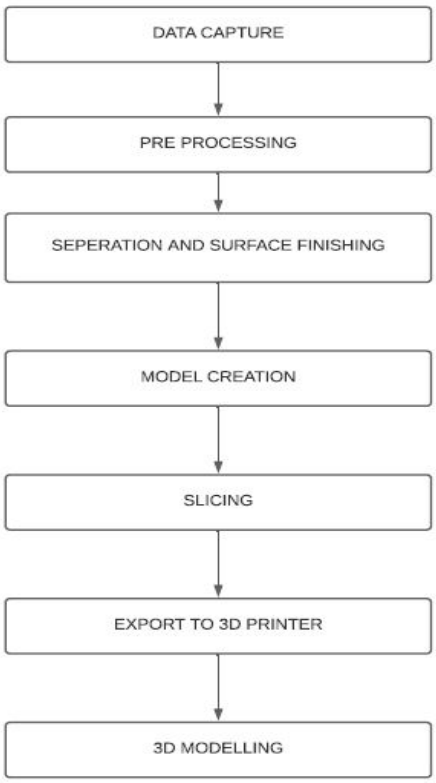

Fig.3: Methodology of 3D printing

OPERATION OF 3D PRINTER

The process of 3D printing (transforming a digital file into solid object) is a quite long and complicated one.

This process is described in the following 4 steps below:

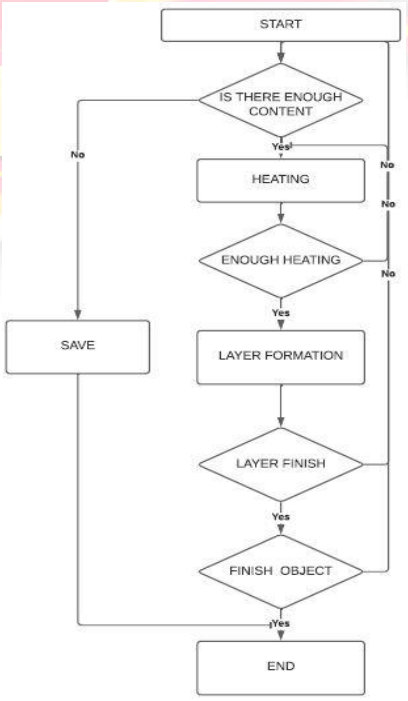

Fig.4: 3D printing algorithm

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Step 1: (CAD) is made with a 3D modeling program, either from scratch or from a 3D model created by a 3D scanner. The program generates a file that is transmitted to the 3D printer in either case. Software splits the design into hundreds, if not thousands, of horizontal layers along the process. These are until the 3D model is complete; layers will be printed one on top of the other. Many applications, such as Solid works and AutoCAD, are used to design 3D objects and have a high learning curve. However, there are a number of alternative programs, many of which are free, that are relatively easy to use. For example, the free edition of Google Sketch Up is really useful. The free Blender program is known for its extensive features, while the free Blender program is known for its ease of use. Step 2 :(motoring) the operation of a 3D printer necessitates low torque, high accuracy motoring. Stepper motors are the finest motor for this job since they are electromagnetic devices that translate digital pulses into mechanical shaft rotation. Low cost, high reliability, high torque at low speeds, and a simple design are all advantages of step motors. They are a type of synchronous motor that is designed to rotate a specific number of degrees for every electric pulse received by its control unit, although only a fraction of a degree can be done. In a 3D printer, four stepper motors are used to move the printer head a specific distance using gears. Step 3 :(processing) Image, graphics processing, and industrial interface options are available on the AM335x microprocessors. The following high-level operating systems are supported by the device: (HLOSs), these subsystems are included in the AM335x microprocessor. 2) Graphics Accelerator 1) Microprocessor unit (MPU) 2) To support display, there is a subsystem for 3D graphics acceleration. Allowing for more efficiency and flexibility by allowing for independent operation and clocking. As well as the ability to scale from 600MHz to more than 1GHz in speed.

Step 4: (MOSFET drive) because a bipolar stepper motor with MOSFET drive can move in both directions, and because a stepper motor is an open loop system, high accuracy components must be used to print in precise locations. MOSFET was chosen because of its fast frequency operation.

SOLUTION FOR DAMAGED PARTS

Fig.5: Reconstructed gear using reverse engineering

Obtaining his CAD model is the first step in repairing the damaged gear wheel. In our case study, we'll suppose that there isn't a CAD model for the original part. 3D scanning procedures are influenced by a variety of elements. One is the Ability of the surface of the components to reflect light is one of them. The expectation for a high-quality 3D scan is for it to be matt and bright the surface. High shine of surfaces, such as chrome-plated surfaces, or black surfaces that do not reflect laser rays, are issues with optical scanning systems. The surface color of our example part is theoretically suitable for 3D scanning; however, scanning of the point cloud revealed an issue surface that hasn't been altered. As a result, the scanning was wrong. This problem appears to be made up of points in space. The number of the number of points scanned in this manner is large, and it poses a severe problem when CAD modifications are made for rapid prototyping. procedures One way to get rid of this obnoxious effect is to use the points overlay reduction technique which, depending on the options, allows us to immediately remove the unneeded point. Because the number of these points is so large, this software function can only be used in small batches, and the results will be unacceptable. We employed “control penetration coating” for surface color alteration to achieve this result. With the use of this coat, we were able to transform the color of the tested part's surface to white, allowing us to scan the surface more precisely. After these changes, we have a gratifying point cloud, which was before unsatisfactory. Ready to be processed again. Following the surface scanning, we required an axis for the CAD design of the component's missing element. For this, we employed a FARO measurement system with a 3 mm probe to scan the inside cylinder of the gear wheel. We were able to fill in the missing axis for tooth system patterning, and the smaller cylinder surfaces helped us define the gearing pattern angle.

PREPERATION FOR PROTOTYPING

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A transformation of the point cloud from Poly Works into 3D software CATIA V5 served as the starting point for further alterations of the scanned surface and the production of a 3D CAD model. This was accomplished through the use of a universal file format for data transfer between different 3D software packages. The ability to transfer large amounts of data is a benefit of this file type. In this scenario, we're discussing a number of different point positions. Because the point cloud does not interpret the final surfaces, it only interprets the surface points, it was critical to convert the point cloud into usable form during this phase of our project. A number of processes are required to construct the final surface by overlaying the point cloud with a mesh. Catia's Digitized Shape Editor was used. The number of scanned points determines the final surface quality. A total of 603 612 points were scanned using laser scanning on the gear wheel surface. This number of points serves as our solution's starting point. We were able to reduce the number of points to 58 581 Utilizing the points reduction method and points overlay techniques, resulting in a solvable set of points. The quantity of points decreased by nearly 90 percentages as compared to the first set. In numerical expression, such a diminishing large amount is represented. It doesn't really matter from a function standpoint. We can also acquire the final surface with a less number of points. The proper positioning of single surface guiding points is a must. In situations where the direction vectors abruptly change, it's critical to follow the rule concerning denser point placement. This provides for the tightest surface overlay while changing a curve. We had to keep this and other crucial things in mind because it deals with a difficult shaped element in our scenario. We had to go out solely from scanned places because the full basic technical data of the gear wheel was absent. This was the ideal approach to put reverse engineering methodologies to the test on a real-world example of a functional item that was already broken and missing 1/5 of it. Depending on the situation, we choose a 3D model production approach that mostly eliminates surface faults in the gear wheel. The creation of the teeth system was done in stages, with the goal of making good use of scanned and reduced points. The final surface was divided into numerous functional units, each of which was given its own attention. After we placed them all together, these individual units created the entire part. Processing construction solutions into final shapes necessitated the use of more techniques and a wide range of CATIA software support applications and modules. The final result is a 3D planar model that describes the surface of the gear wheel as specified by the scanned point cloud. The surface part was converted to a solid part, which was then compared to the original scan. As there is clear interlacing of the 3D model and the scan, the comparison verified the accuracy of the chosen progress of construct solution.

ADVANTAGES OF REVERSE ENGINEERING

The cost of manufacturing complexity is zero: Complicated designed object shapes are more difficult to create in traditional subtractive manufacturing. Complex and simple objects demand the same amount of effort on a 3D printer. There's no charge for variety: Traditional manufacturing machines are far less adaptable and can only manufacture products in a restricted variety of shapes, but a single 3D printer can manufacture multiple shapes. There is no need for assembly because 3D printing creates interlocking pieces. Machines generate identical components in modern factories, which are then assembled by robots or humans. Many pieces are used in complicated designed things, which takes longer to assemble and costs more to produce. Traditional manufacturing machines still require a knowledgeable specialist to modify and calibrate them, but a 3D printer obtains the majority of its instructions from a design file. A 3D printer requires less operator expertise to create an object of equivalent complexity than a standard subtractive machine, resulting in less money and expense manufacturing that is small and portable. A 3D printer has more manufacturing capacity per volume of production space than a typical manufacturing machine. An injection machine, for example, can only manufacture items that are substantially smaller than it. A 3D printer, on the other hand, can create items as huge as its print bed. A 3D printer can produce objects larger than it if its printing apparatus is configured so that it may move freely. Because of their small physical footprint and high production capacity per square foot, 3D printers are perfect for home or office use. Less waste by-product: 3D printers produce less

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waste by-product than traditional metal manufacturing techniques, resulting in lower losses and more efficiency. Manufacturing Job Loss: This disadvantage is debatable; yet, as with any new technology, manufacturing jobs will be lost. This disadvantage may have a negative impact on the economies of third-world countries that rely heavily on low-wage jobs. Limited Materials: Each printer is limited to using only one type of material or a limited range of materials. As a result, producing various products necessitates the use of several printers or the modification of a single printer. Size: At the moment, 3D printers are limited in terms of the size of the products they can generate; therefore printing larger, more sophisticated objects necessitates larger machines, which are more expensive.

CONCLUSION

The goal of the post was to show how to use reverse engineering and 3D printing to rebuild gears. Simple caliper measuring equipment and a laser scanner designed for automatic reconstruction of the object's geometry were employed to achieve the targeted purpose. The Fusion 360 application was used for data analysis and processing, and it proved to be multipurpose in terms of 2D and 3D design, automatic gear generation, and technical documentation preparation. At the end of the process, software specific to the 3D printer was utilized to set the manufacturing parameters. With the current adverse market condition, how businesses tackle the issue of maintenance is critical to their long-term success. The tiniest failure produces a standstill, which usually results in expenditures and losses. Ifthefailure is caused by a spare part that is no longer accessible on the market; the expenses can be significantly greater. The inability to fix a broken machine causes a demand, which is supplied by the Reverse Engineering process. Engineering reconstruction can be done in a variety of ways, and there are different IT tools for modeling and creating technical documentation. The utilization of proper procedures, software, technology, and material is linked to the quality of the final element. And their diversity allows for the right selection of solutions for the chosen element, taking into account a variety of aspects such as geometric complexity, aesthetic values, and the element's function. Furthermore, because 3D printing eliminates the need to start the full production line, it is great for producing a single item. It lowers the prices, time, and effort required in the traditional manufacturing process. Furthermore, it does not differ from traditional procedures in terms of precision or quality of made goods. Having a digital representation of a physical piece also allows you to upgrade it without incurring additional expense. These enhancements can be attributed to modifications in the object's shape or the selection of a superior material.

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Application of Fuzzy in Geo science

Shajahan P[1]. M, Padmapriya.V.K[2], Nice.C.A[3], Sarmishta.C[4]
[1]Assistant Professor, Department of Science & Humanities, IES College of Engineering, Thrissur, Chittilappilly, Kerala
[2]HoD, Department of Science & Humanities, IES College of Engineering, Thrissur, Chittilappilly, Kerala
[3,4] Assistant Professor, Department of Science & Humanities, IES College of Engineering, Thrissur, Chittilappilly, Kerala

Abstract- Fuzzy aspects have become very important in GIS aspects. Topological relations between the spacial things play an important roll in GIS. Topological relations for modeling of spatial objects, the union and intersection of the boundary and exterior, boundary and interior, are explained by special topological concepts. The concept of soft set for characterization is also applied in the paper. We take different parts of the area of India to check the spread of a leaf that may be extended for many security aspects.

Keywords: - Fuzzy sets, GIS, Soft sets, Multi set, Interior, Exterior, Boundary.

INTRODUCTION

Much kind of uncertainties rule the human mind and perceptions. In many fields such as medicine, engineering, physical, biological, chemical etc deal with these uncertainties. Reason behind these uncertainties and vagueness may be due to the perception of human mind. From these we came to the conclusion that classical set theory cannot deal problems from uncertainty.

LITERATURE REVIEW

A number of various mathematical tools such as bi valued theory, probability theory, fuzzy set [9]; soft sets [3] rough sets [2] are well known and are well efficient models for dealing with vagueness and uncertainties. To express the uncertain value fuzzy set [1] was initiated, whereas soft sets [3] rectified the inadequacy of parameterization. Multi set allow multiple occurrence of an element.

Chen [5] gave new one as reduction of parameterization. Magi ET. al.[6] presented fuzzy soft sets. Alkhazaleh[7] proposed a new concept as soft multi set, which was a generalization of Molodtsov soft set theory. Salleh and Alkhazaleh explained the application of soft multi set in decision making problem. In 2011 Salleh gave a brief literature survey from soft sets to intuitionist fuzzy soft sets, which is theory saying about the non membership using Moment Distribution method [1]. Steel used for the RCC members In 2012 Alkhazaleh and Salleh [8] proposed the new concept of fuzzy soft multi set theory and studied the application of this theory.

This paper views on fuzzy soft multi set theory, its exterior, interior, boundary, open set closed set. What can be the result if we continuously apply these operations is it similar to our usual topological results. One may wonder if there exists a surprise change in result. Throughout the paper we investigate whether fuzzy settings make change on soft multi set theory. This paper can be treated as an extensive study of "Interior exterior and boundary of fuzzy soft multi set topology on decision making" [10].

METHODOLOGY

Preliminaries

Definition 1.1. [3] Let U be an initial universe set and E be set of parameters. Let P(U) denotes the power set of U and $A \subseteq U$. A pair (F, A) is called a soft set over U, where F is a mapping given by $F: A \to P(U)$.

Definition 1.2. [9] A Multiset M drawn from the set X is represented by a function Count M or C_M defined as $C_M: X \to N$, where N represents the set of non negative integers.

Definition 1.3. [4] Let U be an initial universal set and let E be a set of parameters. Let I^U denote the power set of all fuzzy subsets of U. Let$A \subseteq E$. A pair (F, E) is called a fuzzy soft set over U, where F is a mapping given by $F: A \to I^U$.

Definition 1.4. [8] Let $\{U_i : i \in I\}$ be a collection of universes such that $i \in IU_i = \varphi$ and let $\{E_{U_i} : i \in I\}$ be a collection of sets of parameters. Let $U = \pi_{i\in I} P(U_i)$ where $P(U_i)$ denotes the power set of U_i, $E = \pi_{i\in I} E_{U_i}$ and $A \subseteq E$. A pair (F,A) is called

a fuzzy soft multiset over U, where F is a mapping given by F: A → U, for all e in A. $F(e) = \left(\left\{\frac{u}{\mu_{F(e)}(u)}\right\} : i \in I\right)$.

Denition 1.5. [8] The union of two soft multisets (F,A) and (G,B) over U, denoted by $F, A \cup (G, B)$ is the soft multiset (H,C) where $C = A \cup B, \forall \varepsilon \in C,$

$H(\varepsilon) = F(\varepsilon)$,if $\varepsilon \in A - B$

$= G(\varepsilon)$, if $\varepsilon \in B - A$

$= F(\varepsilon) \cap G(\varepsilon)$, if $\varepsilon \in A \cap B$

Definition 1.6. [8] The intersection of two soft multisets (F,A) and (G,B) over U, denoted by $F, A \cap (G, B)$ is the soft multiset (H,C) where $C = A \cup B, \forall \varepsilon \in C,$

$H(\varepsilon) = F(\varepsilon)$,if $\varepsilon \in A - B$

$= G(\varepsilon)$, if $\varepsilon \in B - A$

$= F(\varepsilon) \cup G(\varepsilon)$, if $\varepsilon \in A \cap B$.

Invasion of alien plant species is one of the most serious global problems. It has become a serious problem. Alien plant species invade both natural and semi natural ecosystems. Mikania micrantha is one of the 200 worst alien species, is among the ten worst exotic species in europe and South Asia, and one of the 16 most exotic species in China. One of the main such plant is Mikania micrantha, which is a invasive alien species, is native to Central and South America. It has invaded the moist tropical regions of the Pacific, South-east Asia, India, China and other countries of the world. It is extremely fast growing, perennial vine and is considered as one of the worlds most notorious invaders. Once it has established, it kills nearby plant species by reducing light beneath its canopy. Invasive species such as Mikania micrantha pose a serious threat to bio-diversity. It was came to India during World War II to camouflage age airfields or as ground cover for tea plantations. It has spread to most tropical and subtropical regions and the south and north-east of India. Its feather-like seeds are dispersed by wind. A single stalk can produce between 20 and 40 thousand seeds a season. The plant grows very quickly (as fast as 80 to 90 mm in 24 hours for a young plant) . Mikania micrantha was a problem in India, covering more than 15% of Kerala forest. Economic gains due to Mikania micrantha are meager compared to the loss due to its infestation in various ecosystems. It is used as a fodder in many countries. Sheep preferentially grazed Mikania micrantha in Malaysia and other cattle also relish it. It has many goog and bad effects. In Kerala, India, the weed is utilized as a fodder in some parts of the state, especially during summer when availability of grass is scarce. However, it is a cause for hepatotoxicity and liver damage in dairy cattle.

Figure-1

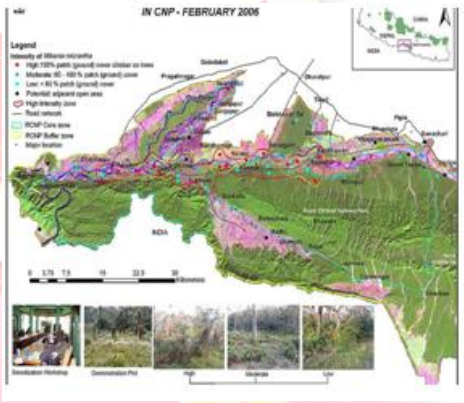

Figure-2

Here we wish to give a mathematical model to this problem and thereby know the most spread area and less spread area of Mikania micrantha, and it will be more helpful to prevent the quick and depth growth of Mikania

micrantha using some biological and mathematical methods. The objective of the study is to give

Table:1

ID	Area	Ext. & Var ue	α= 0.3			α= 0.45			α= 0.6		
			Ext	Int.	Bou	Ext	Int.	Bou	Ext	Int.	Bou
1	8.70	0.24	0.76	01.00	0.23	0.77	0.00	0.24	0.77	0.00	0.23
2	17.19	0.32	0.68	0.31	0.31	0.69	0.00	0.32	0.69	0.00	0.31
3	27.00	0.37	0.65	0.37	0.36	0.64	0.00	0.36	0	0.00	100
4	73.93	0.45	0.55	0.46	0.46	0.54	0.46	0.47	0	0.00	1.00
5	86.16	0.476	0.52	0.47	0.48	0.52	0.48	0.48	0	0.00	1.00
6	145.0	0.54	0.47	0.53	0.47	0.52	0.47	0.48	0	0.00	1.00
7	193.2	0.57	0.43	0.57	0.44	0	0.57	0.43	0	0.00	1.00
8	266.4	0.61	0.40	0.61	0.40	0	0.60	0.42	0	0.00	1.00
9	313.6	0.61	0.38	0.62	0.38	0	0.62	0.38	0	0.62	0.39
10	1013.	0.76	0	0.75	0.25	0	0.75	0.27	0	0.75	0.26

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extension[10] using fuzzy soft topology. For the purpose we use the data collected by them. Based on the infrared photos each area was zoomed and digitalized and size was recorded, also the affected area by Mikania micrantha was noted by percentage level, these are available from the previous studies of Hong Kong.

Each area affected by Mikania micrantha in the aerial photo is viewed as a fuzzy set or fuzzy point in the soft multi fuzzy space. The fuzzy soft value of each area affected by the plant is defined as

$(\frac{\log(\text{Area of certain affected area})}{\log(\text{Total area of affected area})}$, which is a well-defined collecton of mapping from the interval [1,∞] to the interval [0, 1]. From many studies it was found that some Mikania micrantha plants are infected with viruses and which may lead to the small growth level when compared with the non infected ones. So we wish to put these as parameters, that are highly infected viruses, moderately infected viruses, and partially infected viruses. Size of each growth area is given in the first table

We take some of the values from this table to find an optimal solution for our problem. Here the structure of a soft topology is created once a number (0 <α< 1) is chosen.Consider the fuzzy values of each areas U= (ID1, 0.24), (ID2, 0.32),(ID3, 0.37),(ID4, 0.45),(ID5, 0.54), (ID6, 0.57),(ID7, 0.24),(ID8, 0,61),(ID9, 0.63),(ID10, 0:74)

shows For Different α the different soft fuzzy Interior, Exterior and boundary taking the fuzzy soft sets (F;A) and (G;B) and we will find "(F,A) AND (G,B)", so we will get 10 and 3 = 30 parameters of the form eij, where eij = $a_i \Lambda b_j$, for all i = 1, 2, 3, ….10, j =1, 2, 3.

Suppose C = $\{e_{11}\Lambda\alpha_1, e_{12}\Lambda\alpha_2, e_{13}\Lambda\alpha_3\}$ be the set of parameters of which area is mostly affected by Mikania micrantha and also which is infected with virus. Here $e_{11}\Lambda\alpha_1$ we mean as the level of infected area of Mikania micrantha which is infected by virus. Also here we take the max{interior, Boundary} to obtain a resultant fuzzy soft set. On the basis of this parameter we have to take the decision that which area is mostly infected by Mikania micrantha and of which of those areas are infected by viruses. Using the Minimum principle

Table:2

	$e_{11}\Lambda\alpha_1$	$e_{12}\Lambda\alpha_2$	$e_{13}\Lambda\alpha_3$
ID 1	0.24	0.24	0.24
ID 2	0.32	0.32	0.32
ID 3	0.36	0.36	0.36
ID 4	0.46	0.46	1.00
ID 5	0.48	0.48	0.44
ID 6	0.54	0.54	1.00
ID 7	0.57	0.57	1.00
ID 8	0.61	0.61	1.00
ID 9	0.62	0.62	0.62
ID 10	0.75	0.75	0.75

The comparison table of above resultant fuzzy soft set is as below. Here IDimin IDj is an integer number and IDi dominates IDj for number of parameters. That means the number of soft fuzzy values of IDi greater than that of IDj . When i = j equal values will not count.

Table:3

	ID1	ID2	ID3	ID4	ID5	ID6	ID7	ID8	ID9	ID10
ID1	3	0	0	0	0	0	0	0	0	0
ID2	3	3	0	0	0	0	0	0	0	0
ID3	3	3	3	0	0	0	0	0	0	0
ID4	3	3	3	3	0	0	0	0	0	0
ID5	3	3	3	2	3	0	0	0	0	0
ID6	3	3	3	2	2	3	0	0	0	0
ID7	3	3	3	2	2	2	3	0	0	0
ID8	3	3	3	2	2	2	2	3	0	0
ID9	3	3	3	2	2	2	2	2	3	0
ID10	3	3	3	2	2	2	2	2	3	3

At last we will compute the row-sum, column-sum and the score of each ID is shown as below

Table:4

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	row-sum	column sum	Final Value
ID1	3	30	-27
ID2	6	27	-21
ID3	9	24	-15
ID4	12	15	-3
ID5	14	13	1
ID6	16	11	5
ID7	18	9	9
ID8	20	7	13
ID9	22	6	14
ID10	25	3	22

From the table above, we can see that the maximum value is 22, selected by the area ID10 and it is the most effected and infected area. All the +ve values shows that these areas will increase to a big affected area at an earliest than compared with the -ve value scored area.

CONCLUSION

Here we made a discussion on soft multi interior, soft multi exterior, soft multi closure. Lastly we made a model of decision making which is an application of fuzzy soft Topological spaces. We found the maximum affected area of Mikania micrantha using interior, boundary, and row maximum, row minimum using the numerical value of resultant fuzzy soft set. Studies shows that Mikania micrantha is used as a medicine in many areas especially in Kerela, India. In such areas the study will be helpful to find the most infected virus areas and to give remedial measures. The earlier studies just found the interior exterior and boundary and were unable to extend it to say result for a problem. But this study gives the conceptual definition, application along with quantitative description of topological relations between spacial objects and the outcome of a problem can be predicted.

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Replaceable DPF for Vehicles Other Than BS-VI

Sivaprasad E R[1], Stijo Francis[2], Sathyajith M S[3], Srikant E G[4], Bibin P Varghese[5]

[1,2,3,4]UG Student, Department of Mechanical Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala, India

[5]Assistant Professor, Department of Mechanical Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala, India

Abstract –The Government of India implemented the Bharat Stage-6 (BS-6) standards from the 1st of April 2020. For vehicles to be certified under BS-6 standards, the PM released into the atmosphere must be limited to 4.5 mg/km from the present value of 25 mg/km, under BS-4 standards. But the existing vehicles (BS-IV and older) emit the pollutants in the same level as before. To achieve this standard, a Replaceable Diesel Particulate Filter (DPF) is envisaged which is non-regenerative and replaceable in nature. The Replaceable DPF consists of two filters: Pre-Filter which can filter PM particles up to 10 microns and a Fine-Filter which can filter up to 2 microns. The filters are made up of Borosilicate Glass Fiber material with Aluminum frame to handle high exhaust temperature.

INTRODUCTION

Diesel particulate traps or filters are devices that physically capture diesel particulates to prevent their release to the atmosphere. Some of diesel filter materials which have been developed show quite impressive filtration efficiencies, frequently in excess of 90%, as well as acceptable mechanical and thermal durability. In fact, diesel traps are the most effective control technology for the reduction of particulate emissions with high efficiencies. More precisely, due to the particle deposition mechanisms utilized in these devices, traps are effective in controlling the solid fraction of diesel particulates, including elemental carbon (soot) and the related black smoke emission. It must be remembered that traps may have limited effectiveness, or be totally ineffective, in controlling the non-solid fractions of PM, such as the SOF or sulfate particulates. For this reason, trap systems designed to control the total PM emission are likely to incorporate additional functional components targeting the SOF emission (e.g., oxidation catalysts) and sulfate particulates (e.g., ultra-low sulfur fuels).

LITERATURE SURVEY

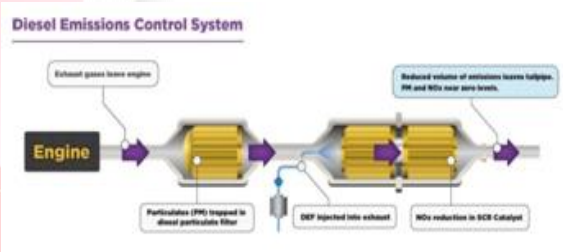

Figure 1.1 Diesel Emissions Control System

SCR technology is designed to permit nitrogen oxide (NOx) reduction reactions to take place in an oxidizing atmosphere. The DEF can be rapidly broken down to produce the oxidizing ammonia in the exhaust stream. SCR technology alone can achieve NOx reductions up to 90 percent while simultaneously reducing HC and CO emissions by 5090 percent, and PM emissions by 30-50 percent. SCR systems can also be combined with a diesel particulate filter to achieve even greater emission reductions for PM

Role of Diesel Particulate Filter

Wall-flow diesel particulate filters usually remove 85% or more of the soot, and under certain conditions can attain soot removal efficiencies approaching 100%. Some filters are single-use, intended for disposal and replacement once full of accumulated ash. Others are designed for regeneration. The composition of the particles varies widely dependent upon engine type, age, and the emissions specification that the engine was designed to meet. Diesel particulate matter resulting from the incomplete combustion of diesel fuelproducessoot (black carbon) particles. These particles include tiny nanoparticles smaller than a thousandth of a millimeter (one micron). Soot and other particles from diesel

engines worsen the particulate matter pollution in the air and are harmful to health. New particulate filters can capture from 30% to greater than 95% of the harmful soot. With an optimal diesel particulate filter (DPF), soot emissions may be decreased to 0.001 g / km or less.

Regeneration in Diesel Particulate Filters

Due to the low bulk density of diesel particulates, which is typically below 0.1 g/cm^3 (the density depends on the degree of compactness) diesel particulate filters can quickly accumulate considerable volumes of soot. The collected particulates would eventually cause excessively high exhaust gas pressure drop in the filter, which would negatively affect the engine operation. Therefore, diesel particulate filter systems have to provide a way of removing particulates from the filter to restore its soot collection capacity. This removal of particulates, known as the filter regeneration, can be performed either continuously, during regular operation of the filter, or periodically, after a pre-determined quantity of soot has been accumulated. In either case, the regeneration of filter systems should be "invisible" to the vehicle driver/operator and should be performed without his intervention. Thermal regeneration of diesel particulate filters is typically employed, where the collected particulates are oxidized by oxygen and/or nitrogen dioxide to gaseous products, primarily to carbon dioxide. Thermal regeneration, is undoubtedly the cleanest and most attractive method of operating diesel particulate filters

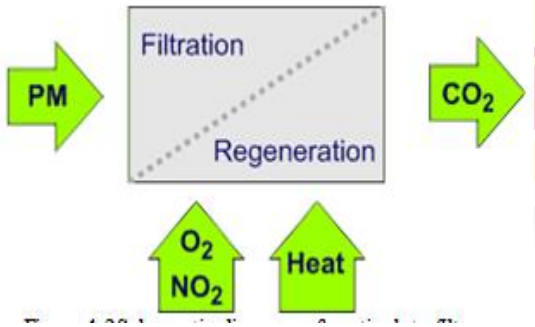

Figure 1.2 Schematic diagram of particulate filter with thermal regeneration

An alternative strategy involves the use of disposable filter cartridges, which are replaced with new units once filled with soot. Particulate filters of this kind are used in occupational health environments.

Filtration Mechanism

There are four kinds of filtration mechanisms: diffusion, interception, inertia and gravity. The **diffusion** collection mechanism arises as aerosol particles deviate from their line of flow due to Brownian diffusion, and are collected by coming into contact with the filter material. In the **interception** collection mechanism, particles that follow along their line of flow are collected by coming into contact with the filter material. The larger the aerosol particles, the easier it is for PM to be collected. The **inertial** collection mechanism is the condition whereby due to a rapid change in flow angle such as At the back end of a DPF inlet channel the PM particles deviate from their flow line as a result of their inertia and are collected by colliding with the filter material. Finally, the **gravity** and electrostatic collection mechanisms also assume PM particles deviate from their flow line due to the respective forces.

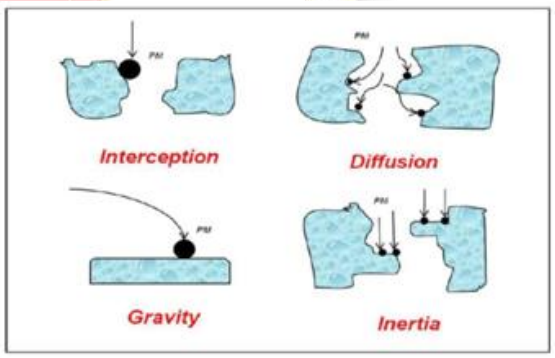

Figure 1.3Filtration Mechanism

DESIGN OF FILTER

The major parameters considered during the design of the filters are Volumetric Flow Rate, Pressure drop before mounting the filter assembly and after mounting the filter assembly and the amount of Particulate Matter emitted by the engine exhaust. Volumetric flow rate is the volume of exhaust gases that flows from the engine exhaust to the filters. Pressure Drop is the reduction in the pressure of the exhaust gases that occurs after mounting the filter assembly. The filter system consists of two parts, a Pre- Filter and a Fine Filter. Each filter has a rectangular structure of length = 150 mm, breadth =150mmand thickness of 40mm.The material used to fabricate the filter is **Borosilicate Glass Fiber** since it is capable of working efficiently at high temperatures of 400^{0}C -

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450^0C for long periods of time without failing. The Pre filter has pores of diameter 10 microns. It is capable of trapping large particles, having diameter greater than 10 microns. The density of pores increases gradually from the first layer to the last layer. The Fine Filter is a corrugated sheet of glass fiber with pores of size 2 microns and thickness of 0.4 microns. The number of corrugated layers is designed based on the pressure drop required. This filter can efficiently trap particles of size greater than 2 microns.

Figure 1.4 Pre filter and Fine filter

DESIGN OF CASING

The casing is made of mild steel sheets with thickness of 1.2 mm. Metal Inert Gas welding (MIG) was used to weld the sheets. The front end of the casing attaches to the exhaust tailpipe and the rear end to the stack. Space is provided for the expansion of exhaust gases before reaching the filter. The filter casing has a square cross section which provides maximum area for filtration for a given volume. The casing has a square pyramid at the rear end of the casing as other designs like cone will create an obstruction to the flow of exhaust gases. Square pyramid enables uniform compression of exhaust gases. It also helps in increasing the exhaust velocity. The casing is designed to have a filter fixture which holds the filters tightly in position with the help of screws. The filter fixture along with the filter slides inside the casing and is fixed with bolts. The filter fixture can be easily removed and the pre-filter and fine filter can be replaced. Since activated charcoal is added in the filter it increases the adsorption rate of the particulate matter.

Figure 1.5 Filter casing

Figure 1.6 Filter casing assembly

CONCLUSION

Bharat stage VI emission norms are the sixth stage for vehicular emissions in India. The BS-VI emission norms are much needed for a country such as India to keep the pollution in check. BS-VI norms are stricter and more restrictive in terms of BS-IV norms allowing for cleaner air and also less pollution in the process. For the best results and for the better performance of the car the BSVI based engines will have to run on BSVI fuel. The new generation modern engines which are running on low-quality fuels will emit more toxic gases compared to that generated by the BS-IV engines. The modern age engine blueprints usually require low Sulphur content to maintain a strong performance. So, by introducing REPLACEABLE DPF FILTER IN OLDER VEHICLES we can achieve BS6 norms i.e., PM released into atmosphere must be limited to 4.5 mg/km up to a certain extent. It can be observed that there is a 50% reduction in the emission of particulate matter from the exhaust after the installation of Diesel Particulate Filter. Hence the DPF has an efficiency of 50% - 55%.

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Analysis of AA-7075/Sic Metal Matrix Composite – A Substitute Material for Connecting Rod

Aaron Joy1, Ajith MJ2, Mohammed Hadi3, Paul Ben4, P P Sarvan5
1, 2, 3, 4UG Student, Department of Mechanical Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala
5Head of Department, Department of Mechanical Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala

Abstract – A connecting rod or con-rod, in a reciprocating engine, connects the piston to the crank or crankshaft. Together with the crank they form a simple mechanism that converts reciprocating motion into rotary motion. It is required to transmit the tensile and compressive forces from the piston. The widely used connecting rod material is cast steel which consumes much fuel due to its high specific gravity. The aim of this project is to develop a new light metal matrix composite for connecting rod emphasizing on the substitution of cast steel. Aluminum alloy from the 7000 series, 7075 is used as metal matrix. SiC is used as reinforcement to further improve the mechanical properties. Stir casting is used to prepare the composite. Three samples are created by varying SiC content. Mechanical properties including compressive strength, tensile strength, hardness and specific gravity were used as the key parameters in the study.

INTRODUCTION

Cast alloy steel is mainly used for the production of connecting rod. Material selection for connecting rod is based on tensile strength, compressive strength, and specific gravity. The main forces acting on a connecting rod are alternating tensile and compressive forces, and buckling load. A good tensile and compressive strength is essential to withstand forces generated due to gas pressure and inertial load acting on connecting rod. A low specific gravity and lower thermal stresses is recommended for a connecting rod material. It is highly desired to improve the fuel consumption rate by a reduction in total weight of the vehicle. It can also reduce the load at crankshaft and bearing, and also significantly reduce vibration during operation. In recent years, research and development has been carried out to substitute the conventional cast steel connecting rod with an aluminum alloy Connecting rod. In this project, we analyze a new combination of an aluminum metal matrix composite using 7075 and Silicon Carbide. Metal matrix composite in three compositions is produced. Amount of silicon carbide is varied (3%, 6%, and 9%) We examined its properties and compared them with properties of cast steel.

A. Metal Matrix Composites

Metal matrix composites (MMCs), like all composites; consist of at least two chemically and physically distinct phases, suitably distributed to provide properties not obtainable with either of the individual phases. Generally, there are two phases either a fibrous or particulate phase in a metallic matrix.

Automotive industry has successfully applied Al-based particulate composites chiefly SiC/Al and Al/Al2O3, in pistons, engine blocks, disc rotor brakes, drums, calipers and other parts. Niño particulate matrix composites have opened gateway to very much advanced desired material properties within the automotive industry. Further research of MMC is focused on production of feasible materials that can be used for connecting rods. Material followed by the introduction of a reinforcement material into the melt, obtaining a suitable dispersion. The next step is the solidification of the melt containing suspended dispersions under selected conditions to obtain the desired distribution of the dispersed phase in the cast matrix. In order to achieve the optimum properties of the metal matrix composite, the distribution of the reinforcement material in the matrix alloy must be uniform, and the wet ability or bonding between these substances should be optimized. The porosity levels need to be minimized.

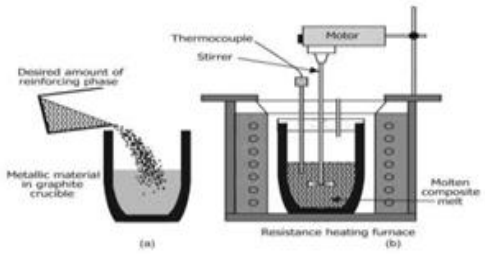

Fig -1: Stir casting setup

C. Connecting Rod

Connecting rods that function in internal combustion engines are subjected to high cyclic loads comprised of dynamic tensile and compressive loads. They must be capable of transmitting axial tension and compression loads, as well as sustain bending stresses caused by the thrust and pull on the piston and by the centrifugal force of the rotating crankshaft. The invention of the crank-connecting rod system has enabled the invention of numerous machines the most notable of which is the internal combustion engine. Starting with the 1962 Buick V6 engine, General Motor's Central Foundry produced 50 million cast pearlitic malleable iron connecting rods for use in 11 different engines, ranging up to 428 cubic inches in displacement. The design was slightly modified from the existing forging designs due to different requirements of the cross-section. Specifically, the I-beam cross section was increased and more generous radii was given to the end of the connecting rod that fits around the crankshaft.

Fig -2: 3D Design of Connecting Rod

II. MATERIALS AND METHODOLOGY

Aluminum alloy AA-7075 is used as the metal matrix in this composite preparation and Silicon Carbide micro-particles SiCp is used as the reinforcing agent. Metal Matrix Composite is prepared by Stir Casting technique wherein discontinuous reinforcement is stirred into molten metal which is then allowed to solidify.

A. Aluminum Alloy AA-7075

7075 aluminum alloy (AA7075) is an aluminum alloy, with zinc as the primary alloying element. It has excellent mechanical properties and exhibits good ductility, high strength, toughness, and good resistance to fatigue. It is more susceptible to embrittlement than many other aluminum alloys because of micro segregation, but has significantly better corrosion resistance than the alloys from the 2000 series. It is one of the most commonly used aluminum alloys for highly stressed structural applications and has been extensively used in aircraft structural parts. 7075 Aluminum alloy's composition roughly includes 5.6–6.1% zinc, 2.1–2.5% magnesium, 1.2–1.6% copper, and less than a half percent of silicon, iron, manganese, titanium, chromium, and other metals. It is produced in many tempers, some of which are 7075-0, 7075-T6, 7075-T651.

Table -1: Composition of AA-7075

Composition of AA-7075	
Aluminium	86.9-91.4%
Zinc	5.1-6.1%
Magnesium	2.1-2.9%
Copper	1.2-2.0%
Iron	0.5% max
Chromium	0.18-0.28%
Silicon	0.4% max
Manganese	0.3% max
Zirconium	0.25 % max.
Titanium	0.2% max
Residuals	0.15% max

Fig -3: AA-7075 rod

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Table -2: Properties of AA-7075

Properties of AA-7075	
Proof Stress(N/mm^2)	480-490
Tensile Stress(N/mm^2)	520-580
Elongation (%)	7.9
Modulus of elasticity(5×102 N/mm^2)	70
Shear Strength(N/mm^2)	330
Specific Gravity	3.0
Coefficient of Expansion(c)	0.000023

Properties of SiC	
Melting Point (℃)	2200-2700
Hardness	2800
Density	3.1
Coefficient of thermal expansion	4
Fracture toughness	4.6
Poisson ratio	0.14
Color	Black

B. Silicon Carbide - SiC

Silicon carbide, also known as carborundum, is a compound of silicon and carbon with chemical formula Sic It was originally produced by a high temperature electro- chemical reaction of sand and carbon. Silicon carbide is an excellent abrasive and has been produced and made into grinding wheels and other abrasive products for over one hundred years. Today the material has been developed into a high quality technical grade ceramic with very good mechanical properties. It is used in abrasives, refractories, ceramics, and numerous high-performance applications. The material can also be made an electrical conductor and has applications in resistance heating, flame igniters and electronic components, floor tiles etc. Structural and wear applications are constantly developing. Silicon carbide is composed of tetrahedral of carbon and silicon atoms with strong bonds in the crystal lattice. This produces a very hard and strong material. Silicon carbide is one of the most extensively used reinforcement in producing metal matrix composite.

Fig -4: Silicon Carbide Particles - SiC_p

Table -3: Properties of SiC

C. Specimen Preparation

A stir casting setup, consisting of a resistance muffle furnace and a stirrer assembly, was used to synthesize the composite. The stirrer assembly consisted of a graphite stirrer connected to a variable speed vertical drilling machine with range of 80 to 890 rpm by means of a steel shaft. The stirrer consisted of three blades at an angle of 120° apart. Clay graphite crucible of 1.5 Kg capacity was placed inside the furnace. Approximately 1Kg of alloy in solid form was melted at 820°C in the resistance furnace. Preheating of reinforcement (SiC) at 800°C was done for an hour to remove moisture and gases from the surface of the particulates. The speed of the stirrer was gradually raised to 800 rpm and the preheated reinforced particles were added with a spoon rate of 10-20g/min into the melt. The speed controller maintained a constant speed of the stirrer, as the stirrer speed got reduced by 50-60 rpm due to the increase in viscosity of the melt when particulates were added into the melt. After the addition of reinforcement, stirring was continued for 8 to 12 minutes for proper mixing of prepared particles in the Matrix. The Melt was kept in the crucible for approximate half minute in static condition and then poured in to the mold. Three MMC specimen variations with varying weight percentages of SiCp (3%, 6%, and 9%) were synthesized. All test specimen samples for material characterization were produced according to ASTM standards. Belt Grinder, Power hacksaw, Center lathe and surface grinding machine were used to create test specimens.

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Fig -5: Graphite Crucible

COMPARISON OF PROPERTIES

Tensile strength and compression strength is to be experimentally studied using universal testing machine adhering to ASTM standards. Hardness of the specimens is to be obtained through Rockwell and Brinnel Hardness tests. Specific gravity of each specimen is found using Archimedes Principle. Properties of Cast Steel EN 1.7225 and AA 7075 are taken for reference.

Table -4: Comparison of properties

Properties	Cast Steel EN 1.7225	AA-7075	SiCp Reinforced AA-7075
Tensile strength (N/mm^2)	590	560	560-590
Compressive strength (N/mm^2)	870	860	860-890
Brinnel hardness number	170	162	162-170
Rockwell hardness number	85	82	82-86
Specific Gravity	7.8	3.0	3.0-3.1

CONCLUSION

From the study it can be concluded that AA7075 reinforced with Sic micro particles can be a good substitute for cast steel in the production of connecting rod since it can achieve good mechanical properties like that of the cast steel with a very much lower weight that can further increase the vehicle performance, reduce load at crankshaft, reduce fuel consumption as well as vehicle emissions.

The composite's tensile as well as compressive strength increased with increase in weight percentage of SiC. Hardness of the specimens also increased with increase in weight percentage of SiC. Al2O3 is also a good reinforcing agent that can be substituted for SiC for MMC fabrication. Stir casting is one of the least expensive but effective way for fabrication of Metal Matrix Composites. The addition of reinforcements should be uniformly dispersed. To ensure more thorough dispersion of reinforcing particles, ultrasonic stir casting can be employed. A micro-structure analysis is important to know the uniform distribution of reinforcing particles within the Aluminum matrix. Heat treatment of alloy also can have a desired increase in mechanical properties such as hardness and tensile strength.

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SOFT COMPUTING

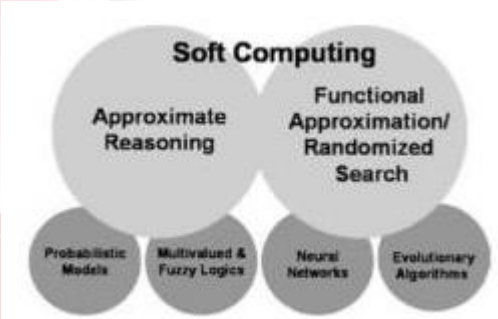
Santhi.P
Assistant Professor, Department of Computer Science and Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala

Abstract-Soft computing, as opposed to traditional computing, deals with approximate models and gives solutions to complex real-life problems. Unlike hard computing, soft computing is tolerant of imprecision, uncertainty, partial truth, and approximations. In effect, the role model for soft computing is the human mind. Soft computing is based on techniques such as fuzzy logic, genetic algorithms, artificial neural networks, machine learning, and expert systems. Although soft computing theory and techniques were first introduced in 1980s, it has now become a major research and study area in automatic control engineering. The techniques of soft computing are nowadays being used successfully in many domestic, commercial, and industrial applications. With the advent of the low-cost and very high performance digital processors and the reduction of the cost of memory chips it is clear that the techniques and application areas of soft computing will continue to expand. This paper gives an overview of the current state of soft computing techniques and describes the advantages and disadvantages of soft computing compared to traditional hard computing techniques.

Index Terms— Soft computing, fuzzy logic, genetic algorithms, neural networks, expert system

INTRODUCTION

Soft computing is an emerging approach to computing that gives the remarkable ability of the human mind to argue and learn in the atmosphere of uncertainty and distrust. Soft computing is based on some biological induced methods such as genetics, development, ant behavior, the warm of particles, the human nervous system, etc. Now SC is the only solution when we do not have any mathematical modeling of problem-solving (i.e., algorithm), in real-time, there is a need to solve a complex problem, adapt with the changed scenario and be implemented with parallel computing. It has massive Applications in many application zones such as medical diagnosis, computer vision, machine intelligence, weather forecasting, network optimization, LSI design, pattern recognition, handwritten character improvement etc.



APPLICATION OFSOFTCOMPUTING

- Robotic works in the form of Emotional Pet robots.
- Food preparation devices are Microwave and Rice cookers.
- For amusing gaming playing product like Checker and Poker etc.
- Recognition for Handwriting.
- Data compression/Image Processing
- For Architecture
- System to Decision-support

IMPORTANCE OFSOFTCOMPUTING

A great example of a particularly effective combination is known as “Neurofjie System”. Such systems are increasingly seen as a consumer product ranging from air conditioners and washing machines to photocopiers and camcorders. There are less visible but perhaps even more important Neurofjie systems in industrial applications. It is especially important that in both consumer products and industrial systems, the use of soft computing technologies leads to systems that have high MIQ (Machine Intelligence Quota). Artificial

SOFTCOMPUTINGTECHNIQUES

1. Neural Networks (ANN): Human brains in a way describe the real world conditions, which computers cannot. In order to solve this issue, for the first time, neural networks were developed in the 1950s. An artificial neural network is an attempt to emulate a network of neurons that makes a human brain so that computers can be able to learn things and make decisions in a human way. ANN is made by regular computer programming, as if they are mutually associated with brain cells.

2. Fuzzy logic: Fuzzy logic is a mathematical logic, which attempts to solve problems with an open, imprecise spectrum of data that makes it possible to get an array of precise findings. Fuzzy logic is designed to be considered the best possible decision by considering all available information and looking an input.

3. Genetic Algorithm: Nature is and will always be an amazing source of inspiration for all of mankind. Genetic algorithms (GA) take all their inspiration from nature, and there are no less genetic algorithms based on search-based algorithms that find its roots in natural selection and concepts of genetics. The genetic algorithm is also a subset of a large branch of computation (also called evolutionary computation).

ARTIFICAL NEURALNETWORK

An artificial neural network (ANN) is the piece of a computing system designed to simulate the way the human brain analyzes and processes information. It is the foundation of Ai. (AI) and solves problems that would prove impossible or difficult by human or statistical standards. ANNs have self-learning capabilities that enable them to produce better results as more data becomes available. Artificial neural networks are built like the human brain, with neuron nodes interconnected like a web. The human brain has hundreds of billions of cells called neurons. Each neuron is made up of a cell body that is responsible for processing information by carrying information towards (inputs) and away (outputs) from the brain. An ANN has hundreds or thousands of artificial neurons called processing units, which are interconnected by nodes. These processing units are made up of input and output units. The input units receive various forms and structures of information based on an internal weighting system and the neural network attempts to learn about the information presented to produce one output report. Just like humans need rules and guidelines to come up with a result or output, ANNs also use a set of learning rules called back propagation, an abbreviation for backward propagation of error, to perfect their output results. An ANN initially goes through a training phase where it learns to recognize patterns in data, whether visually, aurally, or textually. During this supervised phase, the network compares its actual output produced with what it was meant to produce—the desired output. The difference between both outcomes is adjusted using back propagation. This means that the network works backward, going from the output unit to the input units to adjust the weight of its connections between the units until the difference between the actual and desired outcome produces the lowest possible error. During the training and supervisory stage, the ANN is taught what to look for and what its output should be, using yes/no question types with binary numbers. For example, a bank that wants to detect credit card on time may have four input units fed with these questions: (1) is the transaction in a different country from the user's resident country? (2) Is the website the card is being used at affiliated with companies or countries on the bank's watch list? (3) Is the transaction amount larger than $2,000? (4) Is the name on the transaction bill the same as the name of the cardholder? The bank wants the "fraud detected" responses to be Yes Yes Yes No, which in binary format would be 1 1 1 0. If the network's actual output is 1 0 1 0, it adjusts its results until it delivers an output that coincides with 1 1 1 0. After training, the computer system can alert the bank of pending fraudulent transactions, saving the bank lots of money. The idea of ANNs is based on the belief that working of human brain by making the right connections can be imitated using silicon and wires as living **neurons** and **dendrites**.

The human brain is composed of 86 billion nerve cells called **neurons.** They are connected to other thousand cells by **Axons.** Stimuli from external environment or inputs from sensory organs are accepted by dendrites. These inputs create electric impulses, which quickly travel through the neural network. A neuron can then send the message to other neuron to handle the issue or does not send it forward.

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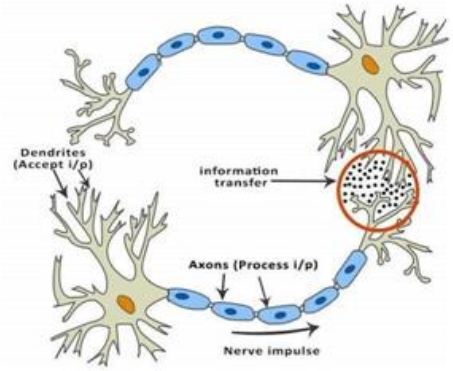
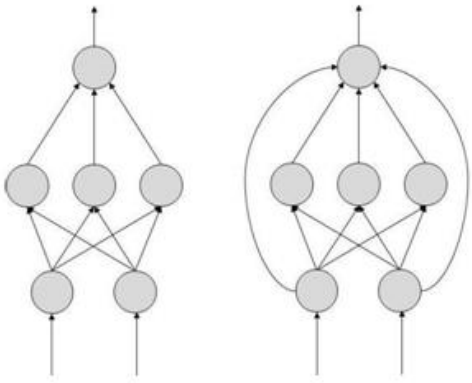
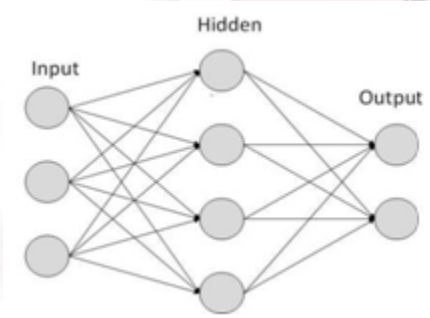




ANNs are composed of multiple **nodes**, which imitate biological **neurons** of human brain. The neurons are connected by links and they interact with each other. The nodes can take input data and perform simple operations on the data. The result of these operations is passed to other neurons. The output at each node is called its **activation** or **no devalues.** Each link is associated with **weight.** ANNs are capable of learning, which takes place by altering weight values. The following illustration shows a simple ANN −

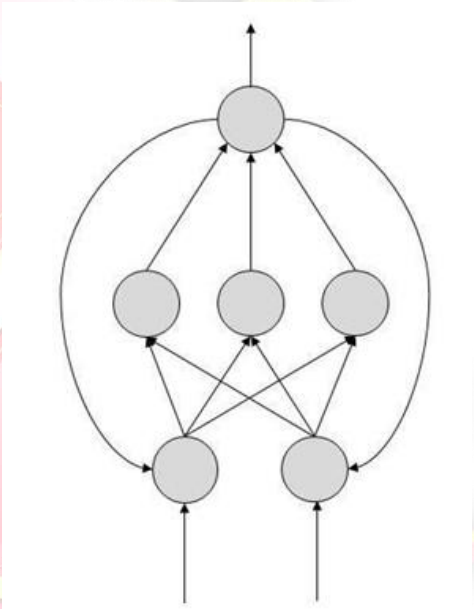


There are two Artificial Neural Network topologies − **FeedForward**and **Feedback.**

FEEDFORWARD ANN

In this ANN, the information flow is unidirectional. A unit sends information to other unit from which it does not receive any information. There are no feedback loops. They are used in pattern generation/recognition/classification. They have fixed inputs and outputs.

Here, feedback loops are allowed. They are used in content addressable memories.



Working of ANNs

In the topology diagrams shown, each arrow represents a connection between two neurons and indicates the pathway for the flow of information. Each connection has a weight, an integer number that controls the signal between the two neurons. If the network generates a “good or desired” output, there is no need to adjust the weights. However, if the network generates a “poor or undesired” output or an error, then the system alters the weights in order to improve subsequent results.

Machine learning inANNs

ANNs are capable of learning and they need to be trained. There are several learning strategies −

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- **Supervised Learning** − It involves a teacher that is scholar than the ANN itself. For example, the teacher feeds

  Some example data about which the teacher already knows the answers. For example, pattern recognizing. The ANN comes up with guesses while recognizing. Then the teacher provides the ANN with the answers. The network then compares it guesses with the teacher's "correct" answers and makes adjustments according terrors.
- **Unsupervised Learning** − It is required when there is no example data set with known answers. For example, searching for a hidden pattern. In this case, clustering i.e. dividing a set of elements into groups according to some unknown pattern is carried out based on the existing data sets present.
- **Reinforcement Learning** − this strategy built on observation. The ANN makes a decision by observing its environment. If the observation is negative, the network adjusts its weights to be able to make a different required decision the next time.

BACK PROPAGATION ALGORITHM

It is the training or learning algorithm. It learns by example. If you submit to the algorithm the example of what you want the network to do, it changes the network's weights so that it can produce desired output for a particular input on finishing the training. Back Propagation networks are ideal for simple Pattern Recognition and Mapping Tasks.

Bayesian Networks (BN) these are the graphical structures used to represent the probabilistic relationship among a set of random variables. Bayesian networks are also called **Belief Networks** or **Bayes Nets.** BNs reason about uncertain domain.

In these networks, each node represents a random variable with specific propositions. For example, in a medical diagnosis domain, the node Cancer represents the proposition that a patient has cancer. The edges connecting the nodes represent probabilistic dependencies among those random variables. If out of two nodes, one is affecting the other then they must be directly connected in the directions of the effect. The strength of the relationship between variables is quantified by the probability associated with each node. There is an only constraint on the arcs in a BN that you cannot return to a node simply by following directed arcs. Hence the BNs are called Directed Acyclic Graphs (DAGs).

BNs are capable of handling multivalve variables simultaneously. The BN variables are composed of two dimensions −

- Range of prepositions
- Probability assigned to each of the prepositions.

Consider a finite set X = {X1, X2, …,Xn} of discrete random variables, where each variable X_i may take values from a finite set, denoted by $Val(X_i)$. If there is a directed link from variable X_i to variable, X_j, then variable X_i will be a parent of variable X_j showing direct dependencies between the variables.

The structure of BN is ideal for combining prior knowledge and observed data. BN can be used to learn the causal relationships and understand various problem domains and to predict future events, even in case of missing data.

Building a Bayesian Network A knowledge engineer can build a Bayesian network. There are a number of steps the knowledge engineer needs to take while building it.

Example problem − *Lung cancer*. A patient has been suffering from breathlessness. He visits the doctor, suspecting he has lung cancer. The doctor knows that barring lung cancer, there are various other possible diseases the patient might have such as tuberculosis and bronchitis.

FUZZIFICATION

Fuzzification is the process of decomposing a system input and/or output into one or more fuzzy sets. Many types of curves and tables can be used, but triangular or trapezoidal-shaped membership functions are the most common, since they are easier to represent in embedded controllers. Figure 7.18 shows a system of fuzzy sets for an input with trapezoidal and triangular membership functions. Each fuzzy set spans a region of input (or output) values graphed against membership. Any particular input is interpreted from this fuzzy set, and a degree of membership is obtained. The membership functions should overlap, in order to allow smooth mapping of the system. The process of fuzzification allows the system inputs and outputs to be expressed in linguistic terms to allow rules to be applied in a simple manner to express a complex system.

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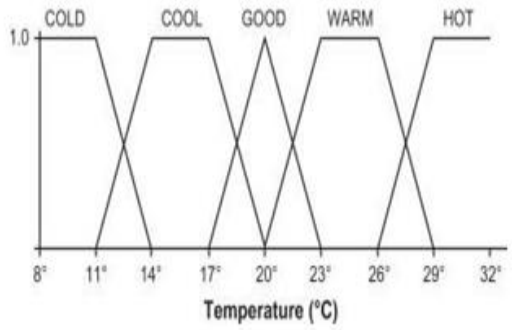

Consider a simplified implementation of an air-conditioning system with a temperature sensor. The temperature might be read by a microprocessor that has a fuzzy algorithm that processes output to continuously control the speed of a motor which keeps the room at a "good temperature"; it also can direct a vent upward or downward as necessary. Figure 7.18 illustrates the process of fuzzification of the air temperature.

There are five fuzzy sets for temperature: COLD, COOL, GOOD, WARM, and HOT. The membership function for fuzzy sets COOL and WARM are trapezoidal, the membership function for GOOD is triangular, and those for COLD and HOT are half triangular, with shoulders indicating the physical limits for such a process (staying in a place with a room temperature lower than 8°C or above 32°C would be quite uncomfortable). The way to design such fuzzy sets depends solely on the designer's experience and intuition. The figure shows some non-overlapping fuzzy sets, which can indicate any in the modeling process. There an input temperature of 18°C would be considered COOL to a degree of 0.75 and would be considered GOOD to a degree of 0.25. To build the rules that will control the air-conditioning motor, we could watch how a human expert adjusts the settings to speed up and slow down the motor in accordance with the temperature, obtaining the rules empirically. For instance, if the room temperature is good, keep the motor speed medium; if it is warm, turn the knob of the speed to fast, and blast the speed if the room is hot. On the other hand, if the temperature is cool, slow down the speed, and stop the motor if it is cold. The beauty of fuzzy logic is the way it turns common sense, and linguistic descriptions, into a computer-controlled system. To complete this process it is necessary to understand how to use some logical operations to build the rules. Boolean logic operations must be extended in fuzzy logic to manage the notion of partial truth – truth-values between "completely true" and "completely false". A fuzziness nature of a statement such as "X is LOW" might be combined with the fuzziness statement of "Y is HIGH" and a typical logical operation could be given as X is LOW AND Y is HIGH. What is the truth-value of this AND operation? Logic operations with fuzzy sets are performed with the membership functions. Although there are various other interpretations for fuzzy logic operations, the following definitions are very convenient in embedded control applications:

Truth(X and Y)=Min(truth(X),truth(Y)) truth(X or Y)=Max(truth(X),truth(Y)) truth(not X)=1.0−truth(X)

GENETICALGORITHM

Genetic algorithm sare parts of artificial intelligence and fuzzy computing and they are mainly used to solve various optimization problems encountered in real- life applications. The basic idea of a genetic algorithm is to mimic the natural selection in nature in order to find a good selection for an application. Genetic algorithm is basically a model of machine learning inspired by the process of evolution in nature. A genetic algorithm can be usedfor finding solutions complex search problems found in engineering applications. For example, they can search through various designs and components to find the best combination that will result in overall better and cheaper design. Genetic algorithms are used in many diverse fields nowadays, such as climatology, biomedical engineering, code-breaking, control engineering, games theory, electronic design, and automated manufacturing and design. The basic processes in genetic algorithms are: xInitialization, where an initial population is created randomly. xEvaluation, where each member of the population is evaluated and the fitness of the individuals are assessed based on how well they fit the desired requirements. Selection, where only the ones that fit the desired requirements are selected. xCrossover, where new individual are created by combining best aspects of the existing individuals. At the end of this it is expected to create individuals that are closer to the desired requirements. The process is repeated from the second step until a termination condition is finally reached.

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EXPERTSYSTEMS

An expert system, also known as a knowledge based system, is a computer based system that can make intelligent decisions by emulating the decision making abilities of human experts. Expert systems are rule based systems and they are part of the artificial intelligence. Expert systems have the abilities that they can change their decisions and make new decisions based on the external factors. Some expert systems are designed to take place of a human in an application, while some others are designed to aid the human. Some application areas of expert systems are: online medical systems for diagnosing a problem, financial loan/credit decisions, legal matters, robotics, and engineering design. One of the main problems in expert systems is the knowledge acquisition. The main components of an expert system are: knowledge base, interface engine, and user interface. The knowledge base is probably the most important part of any expert system. This is where the intelligence of the system is stored. Expert systems in general can acquire new knowledge by their sensors or by training and extend their knowledge bases so that they can easily respond to new problems. The knowledge is stored in the form of IN-THEN-ELSE statements. The interface engine is between the knowledge base and the user. The interface engine makes decisions by following the conditions and the requirements before it comes to an outcome and presents a solution to the user. The user interface is usually in the form of natural language used daily by the user in everyday life. There are basically two types of programming languages: algorithmic and symbolic. Traditional programming languages such as Pascal, Basic C, and FORTRAN are algorithmic, also known as procedural languages, where it is difficult to implement logical inferences in these languages. Several symbolic languages have been developed over the years for expert systems development, such as Prolog, Lisp, and Clips and soon.

CONCLUSIONS

Intelligent systems and hence soft computing techniques are becoming more important as the power of computer processing devices increase and their cost is reduced. Intelligent systems are required to make complex decisions and choose the best outcome from many possibilities, using complex algorithms. This requires fast processing power and large storage space which has recently become available in recent years to many researchcentres, universities, and technical colleges at a very low cost. With the power and the recognition of the Internet of Things (IoT) concept, the need for using soft computing techniques and building intelligent systems have become more important than ever. Nowadays, most soft computing applications can be handled efficiently by low-cost but super-fast microcontrollers. Already we see the use of fuzzy logic, artificial neural networks, and expert systems in many everyday domestic appliances, such as washing machines, cookers, and fridges. Many industrial and commercial applications of soft computing are also in everyday use and this is expected to grow within the next decade. It is the author's opinion that the soft computing theory and techniques and its applications will grow rapidly together with the use of IoT devices in future domestic, industrial and commercial markets

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SOLAR STILL USING HOLLOW CIRCULAR FINS AND PHASE CHANGING MATERIAL DESIGNED FOR FLOODED AREAS AND SEASHORES

Abhilash Xavier1, Jeminson C J2, Syam Prabha3, Shaimil K4, Shillin K S51,2,3,4UG Student,
Department of Mechanical Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala
5Assistant Professor, Department of Mechanical Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala

Abstract – The pyramid solar still has bulky condensing and receiving surface area in compared to the conventional single slope solar still. The present study concerns experimentally with the performance enhancement of this pyramid solar still via additional performance improvers. Hollow circular copper fins array are fitted at the absorber plate in addition to PCM tank below the absorber surface to extend the water production time after the sunset. Obtain the influences of hollow circular fins and PCMon the performance of the pyramid solar still. In the experimentations, the conventional pyramid solar still, pyramid solar still with hollow circular fins, and pyramid solar still with hollow circular fins and PCM were tested at the same Egyptian weather conditions. Saline water depth of 2 cm is hold constant within the basin via compensate feed saline water tank. The experimental results show that, pyramid solar still gives maximum productivity of 8.1 L/m2/day representing 101.5% enhancement in the daily productivity. Comparison between the present modified pyramid solar still and previous experimental and theoretical studies shows efficient performance of the present modified hollow circular fins and PCM pyramid solar still

Key Words: Solar still; solar energy; Hollow fins; PCM (Phase change material); Desalination.

The solar still is mainly used for water purifying and desalination in sea shore and flooded areas. Solar desalination is the process of converting the impure brackish water into potable drinking water using solar energy. The use of solar energy in desalination remains a good alternative method in terms of simplicity and it is environmentally friendly .The solar still is the simplest method used for desalination and Water purification. But it needs improvement as it has low productivity. The solar distillation uses the heat of the sun directly in a Simple piece of equipment to purify water. The Equipment, commonly called as solar still, consists primarily of a shallow basin with a transparent glass cover. The sun heats the water in the basin, causing evaporation... Moisture rises, condenses on the cover and runs down into a collection trough, leaving behind the salts, minerals, and most other impurities. This project focuses mainly on small-scale basin type solar Stills as suppliers of potable water for families and other Small users. In this study an attempt has been made to Bring out an organic phase change material (Paraffin Wax) for energy storage. The material used is refined Paraffin wax of specific grade. In this work the system is fabricated using combination of PCM and water as the storage material. This system consists of solar still which is an equipment to perform the desalination (removing of salt form sea Water) process and paraffin wax as phase change material. Single-basin solar stills can be used for water desalination. Probably, they are considered the best solution for water Production in remote, arid to semi-arid, small communities, Where fresh water is unavailable, however, the amount of Distilled water produced per unit area is somewhat low Which makes the single-basin solar still unacceptable in Some instances. The purpose of this paper is to study the Effect of using phase change materials in a solar still, and thus enhance the productivity of water. In present work phase change material is used to store the solar thermal energy in the form of latent heat, which can offer high storage capacity per unit volume and per unit mass and we can get heat in the night time for desalination. This phase changing material changes its phase from solid to liquid and store solar

energy; during liquid to solid it will release absorbed solar energy.

SOLAR STILL OPERATION

A solar still used for converting brackish/saline water into potable water using solar energy is called solar still. It consists of a shallow blackened basin of saline water covered with a sloping transparent roof. Solar radiation that passes through the transparent roof heats the water in the blackened basin, thus evaporating the water which gets condensed at underside of the glass and gets collected in the tray as distillate attached to the glass. In present project a phase changing material is placed at the bottom of the water tray which is in contact with the water tray at the bot-tom and helps in evaporation by liberating heat after sunset.

EXPERIMENTALSETUP

The present project consist as an equipment called solar Still, which consist of a basin made up of tin of 0.9 m2 area, Having a length of 100cm and 100cm width with 30 cm height. Inside this basin another basin is placed with a distance of 8cm leaving a gap from bottom and sides and in between this gap an insulation material (wood) is placed to prevent loss of heat. The inner box is filled with phase changing material (PCM). The PCM used is Paraffin Wax which will change their phase from Solid to liquid during day time and liquid to solid in the Night, above the PCM 2, 4 and 6cm height of saline water is filled which will evaporate when gets heated by solar Radiation. At the top of the basin a transparent glass is Placed at an inclination of 30deg which is having a thickness of 3mm which will allow the solar radiation to enter into basin consisting of water. When water gets heated it starts evaporating and collects at the underside of the glass cover as vapors. The collected vapors move to the condensate channel which is provided inside the basin. The basin also consists one inlet at the rear end for water in-put and two outlets at front end to collect the water from two condensate channels. In addition to this certain important parameters are to measured simultaneously which are

Temperature, global solar radiation, wind speed and humidity and these are measured using thermometer, anemometer respectively.

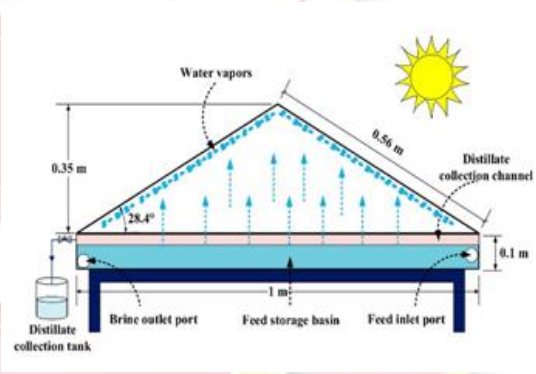

Fig.2

METHODOLOGY

All the experiments were conducted between the time periods of 09:00 to 17:00 hrs when the solar still is without PCM and this time period is extended to two more hours i.e. up to 19:00 hrs. When the PCM is used in the solar still, because to see the effect of PCM in solar still. This experiment will be conducted at IES College of Engineering Mechanical Dept area. This site is 10.564312N, 76.148745E with an altitude of around 265 Feet. The climate is non-semi-arid and is characterized by heavy annual rainfall during rainy season and bright sun shine during winter and summer season. The annual global solar radiation is around 1801 kWh/m2 and around 2722 hours of sunshine per year. The solar irradiance is monitored on PC system. Thermocouples were fixed to take the temperature of water, PCM, glass, insulation and ambient temperature. The experiment is conducted during the time period of 09:00 hrs to 17:00hrs in the absence of PCM. The 6 Cm height water tray

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is filled with 2 cm of brackish or saline Water. The above procedure is repeated for 4 and 6 cm Height of water in tray.

RESULTS AND DISCUSSION

The experiments were conducted for different thickness of water level which for 1,1.5 and 2 cm thickness in solar still without PCM and with PCM, to compare the results when the global radiation is similar during both the experiment shows the comparison of global radiation which is nearly similar intensity for whole day. It explains about output of water with respect to time and also shows the variation of output with respect to solar Intensity. It reveals that the efficiency of solar still with PCM is better than solar still without PCM. The temperature of the water, glass cover, temperature and global radiation vs. time were taken from solar still when still is without and with PCM which is shown respectively. These graphs are plotted for 1.5 cm height of water level in the solar still. PCM temperature will be taken into account when PCM is used in solar still.

The efficiency of solar still is calculated by using this formula:

H=ML/IAT Where;

M-Mass of the distilled output (ml/hr)

L-Latent heat of water (kg/kJ)

A-Absorber area (m2)

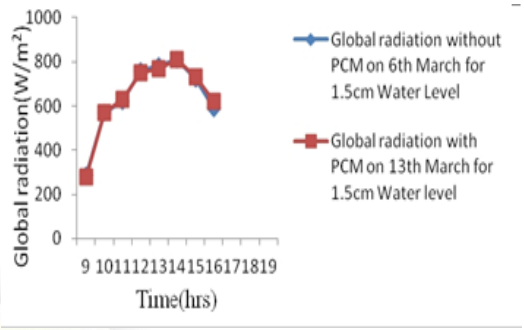
T-Time (sec)

I-Global radiation (W/m2)

Table No.1

Comparison of global radiation on solar still with and without PCM for 1.5 cm water level depth

Time(hrs)	Global Radiation Without PCM(W/m2) Global Radiation with PCM(W/m2) 09:00 290	Global Radiation with PCM(W/m2)
09:00	290	280
10:00	570	570
11:00	620	630
12:00	760	750
13:00	780	770
14:00	810	810
15:00	720	730
16:00	590	600

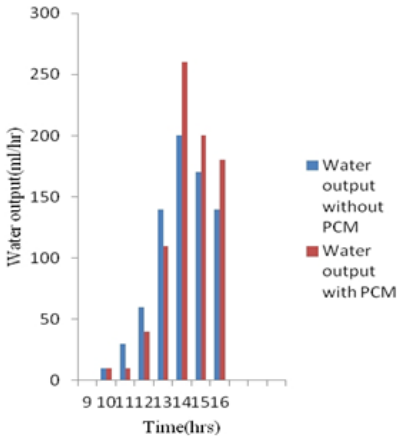


Comparison of Global radiation vs. Time (Without and with PCM)

Table No.2

Comparison of distilled water output for With and without PCM

Time(hrs)	Water output without PCM for 1.5 cm (ml/hr)	Water output with PCM for 1.5 cm (ml/hr)
09:00	0	0
10:00	10	10
11:00	30	10
12:00	60	40
13:00	140	110
14:00	200	260
15:00	170	200
16:00	140	180



Water output vs. Time (without and with PCM)

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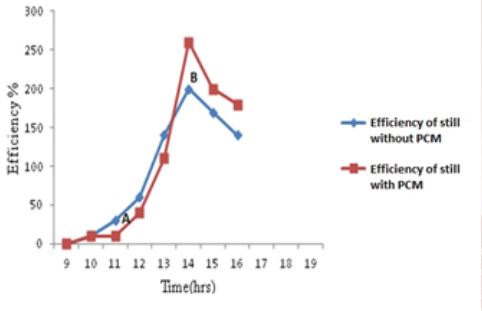
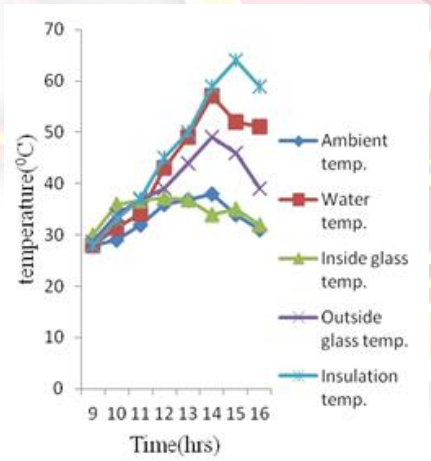
Table No.3

Comparison of Efficiency with and without PCM

Time(hrs)	Efficiency without PCM solar still	Efficiency with PCM solar still
09:00	0	0
10:00	3.38	3.38
11:00	9.329	3.06
12:00	15.22	10.285
13:00	34.6	27.54
14:00	54.76	61.88
15:00	45.52	52.82
16:00	34.6	55.97

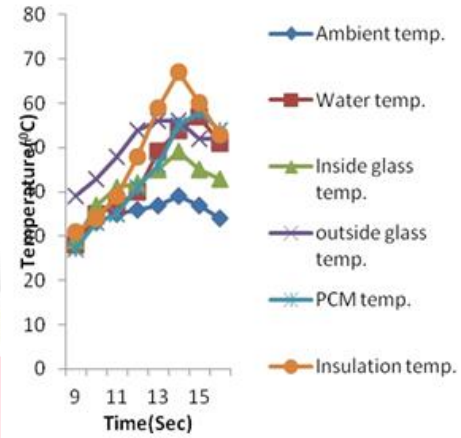


Comparison of efficiency in solar still with and without PCM



Variation of different temperatures in solar still

With and without PCM



Variation of different Temperatures in solar still

With PCM for 1.5cm of water depth

CONCLUSIONS

The purpose of this work is to evaluate the increase in the Productivity of the solar still by using phase changing material (PCM) as a storage medium. Based on the experiment conducted and discussion carried out, the following conclusions are drawn.

1) The use of PCM as storage material in solar still results in Increased distilled water output of about 2% with 1.5 cm of Water depth and 1.96 % for 2 cm water depth
2) The efficiency with PCM is found to be 27% compared to 25.19 % efficiency of still without PCM.
3) The optimal water depth for both types of solar is found to be 1.5 cm.

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HOME MONITORING AND SECURITYSYSTEM

MITHUVARGHESE[1]
[1]Assistant Professor, Computer Science and Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala

Abstract –The Internet of Things (IoT) is stepping out of its infancy into full maturity and establishing itself as part of the future Internet. The paper heading towards digital era where machine to machine interaction takes place with the help of Internet of things. The appliances in the home, office and industry are becoming smart every day. The devices can interact and status can be monitored and controlled using a messaging service called Telegram. The paper uses open-source hardware such as raspberry pi which is a palm computer to interface the appliances in the home. The paper also provides a security system; it has been a comparatively inexpensive security system which has the capability to automatically initiate capture a picture by Raspberry Pi Camera Module when any movement is detected by IR sensor and the Raspberry Pi device will send that picture to the user's smart phone device via Wi-Fi using application. Also, the system will light up the light bulb and LEDs when motion detected. The proposed system is very effective and crucial choice for energy save and security for home or service buildings.

INTRODUCTION

Internet of Things (IoT) has become a technology with large influence across many vertical markets. It is foreseen that many IoT services will provide global reach across millions of simple and sometimes tiny devices. Home automation is the process of controlling electrical devices in our home or office. There are different types of home automation available like remote control, browser based, hand gesture, voice-controlled home automation. In the internet world, people are mostly spending their time with apps so we don't need to shift to other apps to control the appliances in our homes. We can control the device sathomefro many where with these apps. It provide saninter active and friendly interface on the client side, and the devices can be controlled and monitored very easy.

Security is the first attention in everywhere, every time and for everyone. Each person who wishes to be his home and service buildings in safety. The microcontroller in this system is the small computer is Raspberry Pi3. Obviously, Raspberry Pi3 is a single board which, when it is interfaced with the screen, keyboard, mouse and installed the operating system to be able to achieve the functions for any computer. The advantage of using this system is that, it is a very crucial choice for energy saves and home security. Also, another advantage is that it is a simple circuit and able to work at any time in the light day or darkness. The other major advantage is that it is very economic system and it can be placed anywhere.

LITERATURESURVEY

The Home Automation System (HAS) [1] is extension of current activities performed inside the home and this Home Automation System (HAS) can be developed easily now a day's, because of powerful computational devices and wireless sensor network (WSN), to provide user friendly and cost fairly home automation system. In home automation system (HAS), different technologies like Wi-Fi, Bluetooth and Sigsbee are used for communication, and different devices like smart phone, tablet and laptop used for controlling various appliances. "Easy use of appliances" is main motive of this system. In this system home appliances can be monitored and controlled, and the user can interact with the system through a user-friendly interface. The home appliances like fans, lights, switches are remotely controlled through a main control board. By using of the Internet of Things (lot), the developing of home automation is going to become simpler and more popular. Internet of Things (Iota) is nothing but connecting different real-world objects to provide proper communication, synchronization, and inter-connecting between various devices or physical appliances is also

known as "Things". Automation [2] is a technique or a system of controlling a process by electronic devices with reducing human involvement to a minimum. This report presents a design of monitoring and controlling home automation system from an android application based on Adriano. This system uses Wi-Fi technology as a communication protocol to connect system components. Home automation system consists of two main components; the first part is android application that can give orders to units that one wishes to control by locally or remotely and the second part is Adriano that has an appropriate interface to sensors and appliances of a home automation system and communicates with an android application through wireless technology. The Automation system can have a vital role in reducing the total energy consumed by home appliances. The main objective of home automation is to help handicapped and old aged people who will enable themselves in controlling home appliances. The proposed system design is based on a microcontroller device [3], embedded in an Arduino system module. However, a system like that can be based on a large variety of other available microcontrollers, if the developer makes the appropriate changes. Arduino is an open-source electronic, prototyping, computing platform used for system development. It can be used to develop both stand-alone interactive objects, or can operate efficiently with software co-design, supported by another computing system. It consists of a physical programmable circuit board and parts of software coding. The circuit board mainly includes a micro controller device, digital and analog pins, as well as other peripheral components. The proposed system is based on an R3 Board AT mega 328, in conjunction with an R3 Ethernet Shield. The integrated development environment (IDE) runs on a computing system and it is used to write and download the code to the circuit board. IDE is based on a simplified version of C. Internet of Things [4] is a concept where each device is assigned to an IP address and through that IP address anyone makes that device identifiable on internet. The Internet is an evolving entity. It started as the "Internet of Computers." Research studies have forecast an explosive growth in the number of "things" or devices that will be connected to the Internet. The resulting network is called the "Internet of Things" (IoT). IoT is having the potential to change the lifestyle of peoples. In day today's life, people prefer more of automatic systems rather than any manual systems.

METHODOLOGY

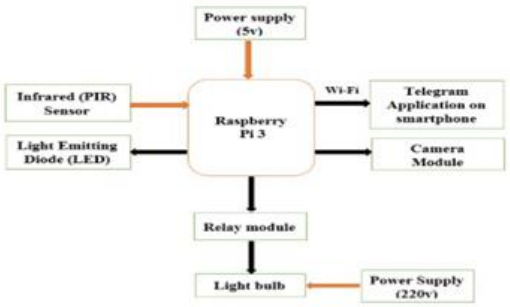

Figure:1 ARCHITECTURE

The new architecture provides decentralized access control system for IoT. It simplifying the whole process and reduce communication overhead. The secure, decentralized and autonomous capabilities make it as ideal component to become a fundamental element for Io T devices. In this we use wireless medium to control all things. As considering about the security we provide a camera in this system. The camera will capture the image of a person In front of the house and send to the telegram application. Then the user identifies the person. If the identified person is familiar to the user, then the user clicks the allow button and otherwise don't allow button. Thus, we ensure the security. Raspberry pi is a credit-card sized computer aimed at providing a computer to every person in the world. This system requires a Micro SD card with a Raspbian OS.Thereisa Messaging API which sends text Messages to the user about the changes in house, for that we provide a telegram app. The system includes the remote control and monitoring of home appliances and security which can do as the Raspberry pi. In this system there isa PIR sensors which is connected to the door this sensor has 180 0 range up to 1 to 2meters approximately. This sensor is very useful than normal IR sensors which have arrange are able to detect people even if they come from side. When a person comes in range of the sensors it sends a trigger pulse which

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activates an LED array and the camera, the LED provide a good light environment. For the camera to take a good photo and so there is no problem of a bad photo in which the person face is not seen which can cause problem. After the camera is activated, it takes the photo of the person present in front of the door and sends a message to the user, also it sends the image to the user phone via telegram app which he downloads to check the person. There are also IR sensors connected in the house through the windows or the back door then the sensor will detect that person

SYSTEMDESIGN

The design and implementation of allow-cost system monitoring based on Raspberry Pi 3, a single board computer which interfaced with PIR Sensor, Raspberry PiCamera Module, LEDs and relay and controlling them by implementing program written in python language in software implementation. Here raspberry pi is connected to the IR sensor, power supply, camera module and a relay module. The devices are controlled by the telegram application. In telegram first we create a bot. Then bot father will provide a token, which act as a password. With this help of the token, we controlled the devices in the home. If we want to switch on the light, we specify the light number and tell the button. Then bot will read the message and respond according the corresponding action. Then we get the same message from the bot like, the light is on. The same case is done for switch on the fan. We can also do the off condition. When concern about the camera module, when a people appear in the front of the door the camera will capture the image of that person and send it to the telegram app. Then the user will identify that person, if the person is known to the user the user will click the allow button. Otherwise, the user will click don't allow button.

CONCLUSION

The paper represents a new security system the table to monitor any movement in the house. The movement is detected by using IR sensor. Using the telegram application, we are monitoring the information. The raspberry pi has two modules, one is the telegram application that execute on the smart phone devices browser and server-side scripts that run by the raspberry pi hardware tool component. This security system works immediately when turning ON the power supply for the system and no need for the user to execute the smart security system. Additionally, this system is the very effective and the crucial system choice for several reasons belong to inexpensive, consumes low power, simple circuit, and advanced system. Comparatively inexpensive security system which has the capability to automatically initiate capture a picture by Raspberry Pi Camera Module when any movement is detected by PIR sensor and the Raspberry Pi device will send that picture to the user's smart phone device via WIFI using application. Is very effective and crucial choice for energy save and security for home or service buildings. Nowadays, in electronic markets, there are many expensive solutions. However, low-cost solutions are very important for spreading between all people. The basic components interacting with each other, one is the Telegram Application that executes on the smart phone device's browser and server-side scripts that run by the Raspberry Pi 3 Hardware tool component. This security system works immediately when turning ON the power supply for the system and no need for the user to execute the smart security system. Additionally, this system is the very effective and the crucial system choice for several reasons belong to inexpensive, consumes low power, simple circuit, and advanced system.

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APPLICATIONS OF INFINITE SERIES

Linty Antony T[1], Abitha P A[2], Jisna V B[3]
[1,2,3]Assistant Professor, Department of Science and Humanities, IES College of Engineering, Thrissur, Chittilappilly, Kerala

Abstract— In this study we define the infinite series and we discussed about the applications of infinite series. Mainly we have discussed the four applications of infinite series. For this purpose, firstly, Power series has been presented. Secondly Taylor series has been discussed. Then as a particular case, Maclaurin's series has been obtained for expanding a function in infinite series. Next we have derived solution of differential equation at an ordinary point in the form of infinite series. Then last, General applications also discussed.

INTRODUCTION

Infinite series, the sum of infinitely many numbers related in a given way and listed in a given order. Infinite series are useful in mathematics & in such disciplines as Physics, Chemistry, Biology and Engineering. For an infinite series $a_1 + a_2 + a_3 + \cdots$, a quatntity $S_n = a_1 + a_2 + a_3 + \cdots + a_n$, which involves adding only the first n terms is called a partial sum of the series. Many mathematical problems that involve a complicated function can be solved directly and easily. When the function can be expressed as an infinite series involving trigonometric functions (sine & cosine). The process of breaking up a rather arbitrary function into an infinite trigonometric series is called Fourier analysis or harmonic analysis and numerous applications in the study of various wave phenomena.

The following points are discuss in this paper,

- Power Series
- Taylor Series
- Maclaurin's Series
- Solution of differential equation
- General applications

POWER SERIES

In this section we define the Power series. Power series in mathematics, an infinite series that can be thought of as a polynomial with an infinite no.of terms, such as $1 + x + x^2 + \cdots$. Usually , a given power series will converge for all values of within a certain interval.

Most of the functions can be represented by power series in some interval

Example 1: $Sinx = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \ldots..$

Example 2 : $Cosx = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \cdots$

Power series have also been used for calculating constants such as π and the natural logarithm base e and solving differential equations.

TAYLOR'S SERIES

Let us defined a function f on $[a, b]$ such that

- The (n-1)th derivative $f^{n-1}(x)$ is continuous on $[a, a + h]$
- The nth derivative $f^n(x)$ exist on (a,a+h)

Then according to the Taylor's theorem we can expand the function f about the point $x = a$ as follows

$$f(a + h) = f(a) + \frac{h}{1!}f^l(a) + \frac{h^2}{2!}f^{ll(a)+\cdots}$$

which is called the Taylors infinite series.

Now putting $x = a + h. \, i.e. h = x - a$

we obtain

$$f(x) = f(a) + \frac{x - a}{1!}f^l(a) + \frac{(x - a)^2}{2!}f^{ll(a)+\cdots}$$

which is the expansion of $f(x)$ with respect to a.

➢ ***Expansion Of Cosine Series at*** $x = \frac{\pi}{4}$

$$f(x) = cosx \qquad f\left(\frac{\pi}{4}\right) = \frac{1}{\sqrt{2}}$$

$$f^l(x) = -sinx \qquad f^l\left(\frac{\pi}{4}\right) = -\frac{1}{\sqrt{2}}$$

$$f^{ll}(x) = -cosx \qquad f^{ll}\left(\frac{\pi}{4}\right) = -\frac{1}{\sqrt{2}}$$

$$\therefore cosx = \frac{1}{\sqrt{2}} - \frac{1}{\sqrt{2}}\frac{(x-\pi/4)}{1!} - \frac{1}{\sqrt{2}}\frac{(x-\frac{\pi}{4})^2}{2!} + \cdots$$

➢ ***Expansion Of lnx at x = 2***

$f(x) = lnx \qquad f(2) = \ln 2$

$f^{l}(x) = -\frac{1}{x} \qquad f^{l}(2) = -\frac{1}{2} \qquad f^{ll}(x) = -\frac{1}{x^2}$

$f^{ll}(2) = -\frac{1}{4}$

$\therefore lnx = \qquad ln2 - \frac{(x-2)}{2} - \frac{(x-2)^2}{8} + \cdots$

A Taylor series is an idea used in computer science, calculus, chemistry, physics and other kinds of higher level mathematics .

IV. MACLAURIN'S SERIES

In this section we introduce the Maclaurin's series. It is the special case of Taylor series.

If we put $a = 0 \; and \; h = x$ in the Taylor's theorem, then for $0 < \theta < 1$

$$f(x) = f(0) + \frac{x}{1!}f^{l}(0) + \frac{x^2}{2!}f^{ll(0)+\cdots}$$

which holds when

- The (n-1)th derivative $f^{n-1}(x)$ is continuous on $[0, x]$
- The nth derivative $f^{n}(x)$ exist on (0,x)

Now if $f(x)$ possesses derivatives of all order in $[0, x]$ and $f(x) = f(0) + \frac{x}{1!}f^{l}(0) + \frac{x^2}{2!}f^{ll(0)+\cdots}$ is the Maclaurin's series .

➢ ***Maclaurin series of cosx***

$f(x) = cosx \qquad f(0) = 1$

$f^{l}(x) = -sinx \qquad f^{l}(0) = 0$

$f^{ll}(x) = -cosxx \qquad f^{ll}(0) = -1$

$$\therefore cosx = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \cdots$$

A Maclaurin series can be used to approximate a function , find the anti -derivative of a complicated function, or compute an otherwise uncomplicated sum.

SERIES SOLUTION OF ORDINARY DIFFERENTIAL EQUATION

Let us consider a second order linear differential equation of the form

$p_0(x)\frac{d^2y}{dx^2} + p_0(x)\frac{dy}{dx} + p_2(x)y = 0$ .....(1)

Where $p_0(x), p_1(x) \; and \; p_2(x)$ are given functions of x over a domain S. The above equation can be written as

$\frac{d^2y}{dx^2} + p(x)\frac{dy}{dx} + q(x)y = 0$ .....(2)

where $p(x) = \frac{p1_{(x)}}{p_0(x)}$ and $q(x) = \frac{p2_{(x)}}{p_0(x)}$

- **Ordinary point**:

Definition: A point $x \in S$ at which $p_0(x) \neq 0$ that is $p(x) and \; q(x)$ are both analytic is called an ordinary point of Eq.(2), other points of S will be called singular points.

- **Solution at an ordinary point:**

Let x_0 be an ordinary point of

$\frac{d^2y}{dx^2} + p(x)\frac{dy}{dx} + q(x)y = 0$ .....(3)

Over a domain S.

Let $a_0 \; and \; a_1$ be two arbitrary constants ; then there exist a unique function $y(x)$ which satisfies the differential equation (3) which is regular in a certain neighbourhood of x_0 and which satisfies the initial condition $y(x_0) = a_0$.

Without any loss of generality , we may take $x_0 = 0$ then $p(x)$ and $q(x)$ are regular in a neighbourhood $x < R$ of the origin.

In this neighbourhood $p(x)$ and $q(x)$ are expressed in the form.

$p(x) = \sum_{m=0}^{\infty} p_m x^m$, $q(x) = \sum_{m=0}^{\infty} q_m x^m$,(4)

Now, we have to obtain a series solution of (3) in the form

$y(x) = a_0 + a_1 x + a_2 x^2 + \cdots$

i.e. $y(x) = \sum_{m=0}^{\infty} a_m x_m$ .....(5)

where $a_0, a_1, a_2, \ldots$ are certain constants .

Let us assume that the term by term differentiation is allowed.

$\therefore \frac{dy}{dx} = \sum_{m=0}^{\infty} m a_m x^{m-1} \; and$

$\frac{d^2y}{dx^2} = \sum_{m=0}^{\infty} m(m-1) a_m x^{m-2}$ (6)

Now substituting (4),(5),(6) in (3) we have

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$$\sum_{m=0}^{\infty} m(m-1)a_m x^{m-2} + \left(\sum_{m=0}^{\infty} p_m x^m\right)\left(\sum_{m=0}^{\infty} m x^{m-1} a_m\right) + \left(\sum_{m=0}^{\infty} q_m x^m\right)\left(\sum_{m=0}^{\infty} a_m x_m\right) = 0$$

Now , equating the coefficients of like powers of x we have

-2.1. $a_2 = ca_0 + q_0 a_0$

-3.2. $a_3 = 2a_2 p_0 + q_1 p_1 + q_0 a_1 + q_1 a_0$

.....

.....

-m(m-1) $a_m = (m-1)a_{m-1} +$

$(m-2)a_{m-2}p_1 + \cdots$ (7)

From Eq(7). we can successively determine $a_2, a_3, a_4, \ldots$ in terms of a_0 *and* a_1 uniquely if $a_2, a_3, a_4, \ldots$ are linear combinations of a_0 *and* a_1 only.

Example:

Let a differential equation

$\frac{d^2y}{dx^2} - 4y = 0$ ..... (1)

And the power series solution be

$y(x) = c_0 + c_1 x + c_2 x^2 + \cdots$ (2)

$\therefore \frac{d^2y}{dx^2} = 2c_2 + 6c_3 x + 12c_4 x^4 + \cdots$ (3)

Substituting (2),(3) in (1) we obtain

$$(2c_2 + 6c_3 x + 12c_4 x^4 + \cdots) - 4(c_0 + c_1 x + c_2 x^2 + \cdots) = 0$$

$$\therefore (2c_2 - 4c_0) + (6c_3 - 4s_1)x + (12c_4 - 4c_2)x^2 + \cdots = 0$$

Equating the coefficients of various power of x to zero obtain

$$c_2 = 2c_0, c_3 = \frac{2}{3}c_1, c_4 = \frac{1}{3}c_2 = \frac{2}{3}c_0$$

Therefore the solution is

$$y(x) = c_0 + c_1 x + 2c_0 x^2 + \frac{2}{3}c_1 x^3 + \cdots$$

$$= c_0(1 + 2x^2 + \cdots) + c_1\left(x + \tfrac{2}{3}x^3 + \cdots\right)$$

In terms of standard functions, we can write $y(x)$ as

$y(x) = \frac{c_0}{2}(e^{2x} + e^{-2x}) + \frac{c_1}{4}(e^{2x} - e^{-2x})$

$= Ae^{2x} + Be^{-2x}$

Where , A $= (2c_0 + c_1)/4$ and B $= (2c_0 - c_1)/4$

GENERAL APPLICATIONS

1). One of the best applications of infinite series is in harmonic analysis. Any periodic function can be expressed as an infinite series of sine and cosine functions (given that appropriate conditions are satisfied). This is used to then analyze the original periodic function, and then apply filters to it. For example, a sound recording can have its bass removed, or amplified, using roughly this technique.

2). Some differential equations cannot be solved using just one function, but can be approximated as an infinite series (of powers of x). This method is used in the Taylor series expansion method and in the Frobenius method (where the answer is assumed to be a Frobenius series).

3). A simple application is to convert a fraction into a recurring decimal, which is basically an infinite series. For example, 1/3 = 0.3333333..., which can be written as 3/10 + 3/100 + 3/1000 + 3/10000 + ... Hence we have

3/10 + 3/100 + 3/1000 + 3/10000 + ... = 1/3

which means that the more fractions you sum up from the L.H.S., the closer you get to 1/3. Actually 0.3333333... = 1/3 means essentially the same thing; the more digits you write in the decimal representation of 1/3, the closer you're getting to 1/3.

4). Infinite series have applications in engineering, physics, computer science, finance, and mathematics. In engineering, they are used for analysis of current flow and sound waves. In physics, infinite series can be used to find the time it takes a bouncing ball to come to rest or the swing of a pendulum to stop.

5). Maclaurin's series has been obtained for expanding a function in infinite series. Secondly, we have derived solution of differential equation at an ordinary point in the form of infinite series. Also, Fourier series expansion of a periodic function. As a special case, Fourier series of even and odd periodic functions have been obtained

6). Infinite series plays an important role in mathematics, physics and engineering. There are so many physical problems which cannot be solved analytically. The solutions of those problems can be derived in the form of infinite series.

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CONCLUSION

Infinite series plays an important role in mathematics, physics and engineering. There are so many physical Problems which cannot be solved analytically. The solutions of those problems can be derived in the form of infinite series. Infinite series has several applications . In this Paper, Four applications of infinite series have been discussed.

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A PERFORMANCE STUDY ON ROTATIONAL BEHAVIOUR OF SAVONIUS WIND TURBINE IN HIGHWAYS

Rakul.A.Ravi[1], P.P.Sarvan[2]
[1]Assistant Professor, Department of Mechanical Engineering, IES College of Engineering, Thrissur, Kerala, India
[2]Head of Department, Department of Mechanical Engineering, IES College of Engineering, Thrissur, Kerala, India

Abstract - For solving the world energy problem and the use of conventional sources of energy lead to adverse effect on environment. So a great attention is paid all over the world towards the use of renewable energy sources. Special interest is paid towards wind energy because of its clean energy to the environment. But the cost of electricity generated by wind turbine is Rs.12 per unit. It is due to the initial cost and operating cost of the turbines. To overcome this issue a low cost vertical axis wind turbine has been fabricated by using the recycled materials and performance study conducted. Increased the starting behavior of the turbine at low wind speeds and producing electricity at lower rpm of turbine by introducing the modified power generator. Starting behavior of the vertical axis wind turbine was studied by measuring and calculating the starting torque coefficient. The proposed cut-in speed of the turbine was achieved at a velocity of 3.5 m/s.

Introduction

In non-conventional energy resources like wind, geothermal, tidal and solar, the wind and solar are more attractive. the tidal energy has drawbacks like it can only implemented on sea shores. While geothermal energy needs very lager step to extract heat from earth. Solar and wind are easily available in all condition. The non-conventional energy resources like solar, wind can be a good alternative source in future. Solar energy has drawback that it could not produce electrical energy in rainy and cloudy season so we need to overcome this drawback we can use two energy resources so that any one of source fails other source will keep generating the electricity. And in good weather condition we can use both sources combine.

Wind energy is considered the fastest growing clean energy source. In today's life the demand on electricity is much higher than that of its production. In this 21st century there are many methods to produce energy. In renewable energy field sector, wind turbines play an important role in energy production. Petroleum fuels produce more pollution which will cause a major problem in metro cities More electrical energy to be produced as the electricity consumption in the world increases. The wind energy for producing electricity is inexhaustible, free and always available somewhere and there is enough of it. When considering the horizontal axis wind turbine, the efficiency is higher than vertical axis wind turbines due to high surface and body force. On the other hand, from the economic point of view, the initial and maintenance costs are too high and the design is more complicated when compared to the vertical axis wind turbines. A simple difference in working principle is that the horizontal axis wind turbines rotates based on the lift force acted and the vertical axis wind turbines rotates from the drag forces occur in the wind movement. Savonius rotor is a vertical axis wind turbine which is characterized as cheaper, simpler in construction and low speed turbine. This makes it suitable for generating mechanical energy in many countries especially in Egypt. Drag based wind machines are more suitable for harnessing the wind energy from the vehicle traffic in motorways due to its better torque generation in low wind speeds (Goh et al, 2016). Further, the drag based wind machines are classified into different types. They are Savonius, Darrious and Giromill wind turbines. Among these, the Darrious wind turbines do not have the ability to self – start. In the case of Giromill turbines, the rotational speeds

vary even due to small wind fluctuations that occur in the wind speeds at unsteady pulsating wind speeds. This is because of the issues in moment of inertia when the Giromill rotates due to unsteady wind speeds (Hara et al, 2012).

SAVONIUS WIND TURBINE

A Finish engineer Savonius introduced the Savonius rotor in 1920s. He has reformed the design of Flettener's rotor by dividing a cylinder into half, along its central axis and relocating the two semi-cylindrical surfaces sideways. This shape is akin to ―S‖ when viewed from top.These type of rotors may be of two, three or higher bladed systems and can be used in single- or multi-staged arrangements

PRINCIPLES OF SAVONIUS ROTOR WIND TURBINE:

Savonius turbines are one of the simplest turbines. Aerodynamically, they are drag-type devices, consisting of two or three blades (vertical – half cylinders). A two blades savonius wind turbine would look like an "S" letter shape in cross section (figure 1). The savonius wind turbine works due to the difference in forces exert on each blade. The lower blade (the concave half to the wind direction) caught the air wind and forces the blade to rotate around its central vertical shaft. Whereas, the upper blade (the convex half to wind direction) hits the blade and causes the air wind to be deflected sideway around it.

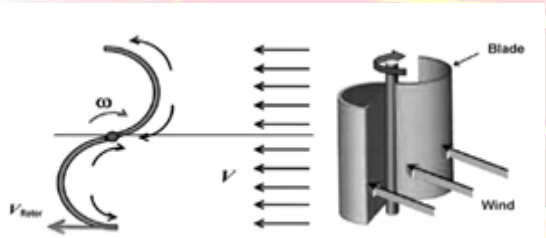

Fig 1 Schematic drawing showing the drag forces exert on two bladeSavonius

Because of the blades curvature, the blades experience less drag force (F convex) when moving against the wind than the blades when moving with the wind (F concave). Hence, the half cylinder with concave side facing the wind will experience more drag force than the other cylinder, thus forcing the rotor to rotate. The differential drag causes the Savonius turbine to spin. For this reason, Savonius turbines extract much less of the wind's power than other similarly sized lift type turbines because much of the power that might be captured has used up pushing the convex half, so savonius wind turbine has a lower efficiency.

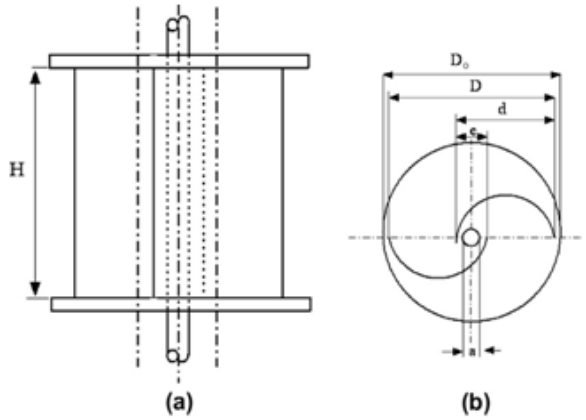

Fig. 2. Scheme of a single-stage Savonius rotor:
(a) elevation view, (b) plan view

In SWT, end plates have some considerable amount of weight to give good inertial force provide stable rotational speeds when there are small wind fluctuations that occur on the flow. SWT is most economical compared to other vertical axis wind turbines due to its simple design and good starting behavior (Belabes et al ,2016). Due to better aerodynamic behavior at low running speeds and low cost, the SWT was selected and used in applications like pumping water, low and high –rise applications for generating electrical energy by means of coupling an electric generator or alternators. India has one of the largest road networks in the world. When a vehicle passes through the road; it produces and drag force and load on either sides. This drag force is used to accelerate the wind velocity on the sides of the roads to rotate the SWT to produce electrical energy. The major challenge in this project was for the selection of a wind based machine that can be accommodated in the available spaces in highways. SWT‘s shape and size makes it suitable for highway applications; it can be placed at the side shoulders and the center median of the highways. Thus before installing the SWT farms on highways, the behavior of the turbine at different wind speeds due to vehicle traffic and monsoons need to be studied. So in this paper, an experimental study was carried out on the high-

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way low rise applications to know the rotational behavior of the SWT at different wind speeds.

LITERATURE SURVEY

A.J. Alexander, B.P.Holownia.,(1978) [1] Wind tunnel test carried out on a number of savonius rotor geometries with wind speeds ranging from 6 to 9 m/s. They conducted that, there is an improvement in rotor performance with increasing the aspect ratio. The test for three and four bladed geometries gives lower efficiency than two bladed rotors. They also concluded that the efficiency of the rotor with end plate and shielding is greater than that with end plate without shielding. Furthermore, the efficiency obtained for a rotor with end plate and without shielding is greater than that of rotor without end plate. They also found that, increasing the rotor overlap ratio increases the rotor efficiency.

F. Mahamarakkalage (1980)[2]examined experimentally and analytically blade geometry, overlap ratio, aspect ratio and Reynolds number on the performance of Savonius rotor. The results showed that optimum geometries of Savonius rotor corresponding to the blade geometry are as follows: gap size of 0, overlap ratio of 0, aspect ratio of 0.77, blade shape parameter of 0.2 and blade arc angle equals 135_. The rotor with the previous configuration will have a peak power coefficient of about 0.32 at tip-speed ratio of 0.79.

Reid A. Berdanier1, et al., (2014)[7] had done the Integrating Vertical-Axis Wind Turbines and Photovoltaic Solar Cells to Power a Self-sustaining Outdoor Light Source This omni - directionality of the VAWT is further increased by the introduction of multiple, phase-offset rotor stages. Moreover, this design incorporates a unique feature enabling the amplification of wind velocities through a converging housing section, allowing for an increase in rotor power coefficient and a low cut-in wind speed. This wind funneling effect is implemented via synergistic integration of the three main product components of the lighting system: wind turbine, solar panel, and light- emitting diode (LED) lighting. Computational fluid dynamics results were incorporated to assist in the development of the rotor sizing parameters and the turbine housing. An LED light product was selected to reduce the amount of power required from the energy production systems. Given the required power of an LED light for an average ten hour night, individual components of the light source, including the wind-swept area of the rotor and the effective area of the PV cells were appropriately defined for sufficient power production. Development and testing of a functioning prototype is also discussed. This light source technology can easily be integrated into any new or existing plans for building walkways, parking lots, and outdoor recreation facilities looking to increase sustainable energy productivity. In addition, further applications of this light source can be applicable to remote areas where grid power is unavailable or where area lighting is needed only for a short period of time (e.g., taking the place of other rental illumination units used in construction areas while avoiding the need for energy consuming generators). The synergistic integration of this light source design makes it superior to its competitors, particularly through its high efficiency (high power coefficient CP), omni-directionality, compact size, low turbine cut-in speed, and grid independence.

SELECTIONOFDEVICES

WIND TURBINE SELECTION

The vertical axis wind turbine, during the process of rotation of the blades, the condition of receiving effects is better than that of the Horizontal axis wind turbine, because the directions of the inertial force and gravity stable ever. There are different types like Darrieuswind turbine, Giromill wind turbine, and Savonius wind turbine.

SAVONIUS WIND TURBINE

Savonius turbines areone of the simplest turbines. Aerodynamically, they are drag-type devices, consisting of two or three scoops. Looking down on the rotor from above, a two-scoop machine would look like an "S" shape in cross section. Because of the curvature, the scoops experience less drag when moving against the wind than, when moving with the wind. The differential drag causes the Savonius turbine to spin. Because they are drag-type devices, Savonius turbines extract much less of the wind's power than other similarly- sized lift-type turbines. Savonius wind rotor is one of the vertical axis wind turbines. It is simple in structure, has good starting characteristics relatively low operating speeds,

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and an ability to capture wind from any direction. But it has a low aerodynamic efficiency. Savonius wind rotor is constructed simply of two vertical half cylinders,

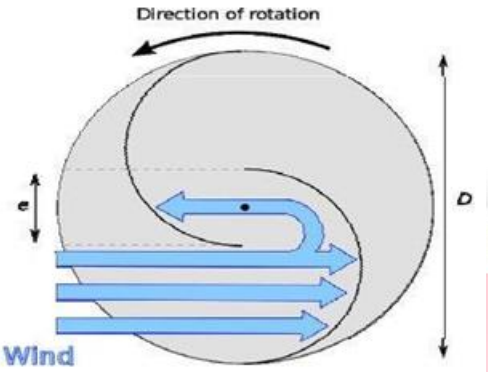

Fig. 3. Wind flow through savonius rotor

CHARACTERISTICS OF WIND TURBINES

Wind Speed

This is very important to the productivity of a windmill. The wind turbine onlygenerates power with the wind. The wind rotates the axis (horizontal or vertical) and causes the shaft on the generator to sweep past the magnetic coils creating an electric current.

Blade Length

This is important because the length of the blade is directly proportional to the swept area. Larger blades have a greater swept area and thus catch more wind with each revolution. Because of this, they may also have more torque.

Base Height

The height of the base affects the windmill immensely. The higher a windmill is, the more productive it will be due to the fact that as the altitude increases so does the winds speed.

Base Design

Some base is stronger than others. Base is important in the construction of the windmill because not only do they have to support the windmill, but they must also be subject to their own weight and the drag of the wind. If a weak tower is subject to these elements, then it will surely collapse. Therefore, the base must be identical so as to insure a fair comparison.

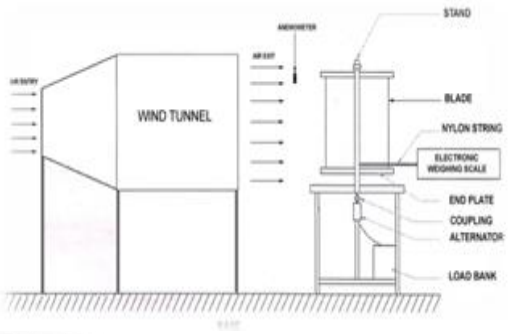

Fig. 4. Schematic diagram of wind tunnel setup

Fig. 5. Fabricated wind tunnel setup

RESULT

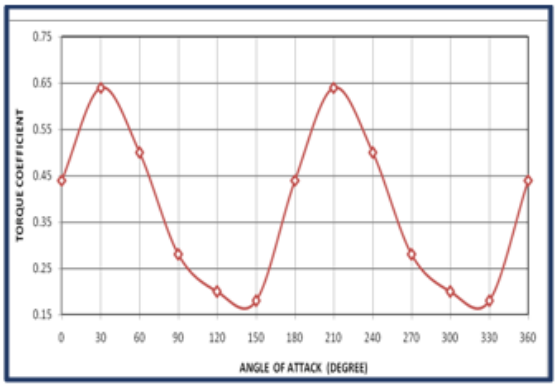

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Fig. 6. Behaviour of SWT in uniform wind

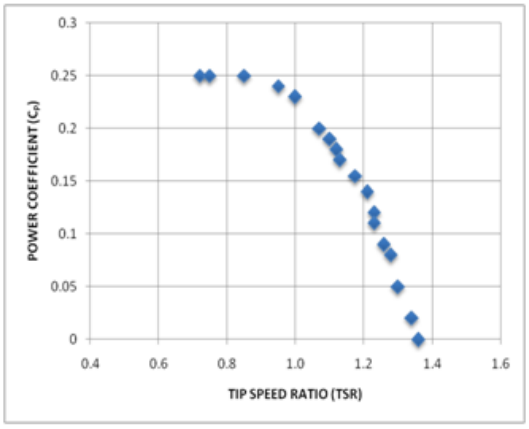

Fig.7. Power coefficient of SWT at different tip speed ratio

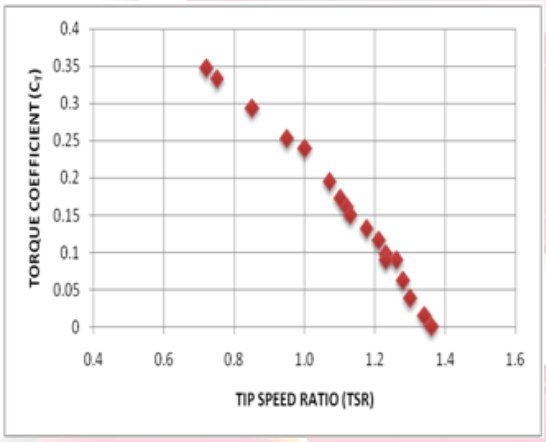

Fig. 8. Torque coefficient of SWT at different tip speed ratio

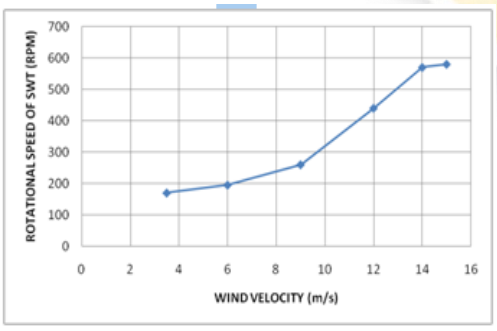

Fig.9. Rotational behaviour of SWT when connected with alternator

CONCLUSION

The experimental setup fabricated and tested in a wind tunnel to determine the behavior at uniform wind speeds. The schematic view of the wind tunnel setup is shown in Fig. 3. The self-starting potential was tested by measuring the starting torque at constant wind velocities. During starting torque measurement, the alternator was coupled with the SWT"s shaft. Torque coefficient calculated using Equation. The starting torque coefficient at different rotor angles is depicted in the Figures. The starting torque coefficient value was highest when the angle of attack was 30°. The From the obtained wind tunnel data, the torque coefficient does not fall below the negative values. Thus, from the Fig. 4 it is inferred that the proposed SWT has good self-starting capacity. From better starting capacity and angular stability, better dynamic torque of the rotor is also expected. The cut- in speed of SWT is 3.5 m/s.

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VOICE CONTROLLED WHEEL CHAIR SYSTEM

Safna K M[1]
[1]Assistant Professor, Department of Computer Science and Engineering, IES College of Engineering, Chittilapilly, Thrissur, Kerala

Abstract- ***The proposed voice controlled wheelchair operates on user's voice commands. The disabled people cannot move from one place to another on their own. They continuously need someone to help them in getting the wheelchair moving. This voice controlled system makes them more independent. Powered wheelchairs with the standard joystick interface are unable to be control by many people. A voice controlled wheelchair can provide easy access for physical disabled person who cannot control their movements especially hands. Few patients such as quadriplegic, cerebral palsy and multiple sclerosis are dependent on other people to move from one place to another and due to this they don't have the freedom of mobility. This voice controlled wheelchair helps them to drive the wheelchair without anyone's help. This system can be controlled by the simple voice commands given by the user. Depending upon the direction specified in the commands, the Arduino will drive the motors. The speech recognition is done by voice recognition module, connected with Arduino. The wheelchair would operate on real analogous voice signal of patient or user using the wheelchair. The main peculiarity of our proposed system is that it can be implemented in any language as per the user preference. Although we are currently implementing the wheel chair, where the user can give commands in the Malayalam language. We are also providing a health monitoring section in our project, where the patient or the relative/guardian of the patient can get notification on their health parameters such as heart rate and temperature of the patient.***

Keywords: - voice control, quadriplegic, cerebral palsy, multiple sclerosis, arduino.

INTRODUCTION

There is a need to thing about the product which will benefit people in society along with its benefit to nation. We will focus on one of the issue faced by the people i.e. Physical disability and will try to provide an engineering solution i.e. an electric wheelchair with maximum liberties and minimum costing. The application of technology in the field of wheelchairs was first tried by George Klein in 1953 consequently this area of technology i.e. electric wheelchair is continuously being flourished and expanding immensely with magnificent discoveries which aims to makes user more competent and potent in the society. Mostly the electric wheelchair developed run with the help of joystick. The further solutions proposed for making it more comfortable are controlling the wheelchair using tongue movement ,hand gesture ,voice command and brain control interface . The tongue is not much feasible as when we are using tongue to control wheelchair we cannot talk and might be hectic for the user for long term use. The hand gesture is better option than tongue but it will cause pain and discomfort after an ample amount of time. The Brain control interface is effective but a very costly solution for wheelchair control. First the area of isolated word recognition technique becomes a usable technology based on the fundamental studies by Velichko and Zagoruyko in Russia, Sakoi and Chiba in Japan and Itakura in U.S. Russian studies helped in a robust pattern recognition ideas.The Japanese study shows how the dynamic programming methods could be successfully applied and an independent research done by Itakura gave an idea about linear Predictive coding (LPC). People with arms and hand impairment finds difficult to use a normal wheelchair as their hands are not capable of operating the normal wheelchair and cannot move it to any direction. Therefore, voice controlled wheel chair is built to overcome the problems faced by such people and enable them to operate the

wheelchair. The wheelchair will be operated using the voice commands through the given input. The Arduino will take care about all the directions the user wants. The instruction for each and every direction i instruction for each and every direction is written in theform of program in the Arduino itself. The voice commands to the wheelchair willbe given by theunilateral mic placed as per the user comfort. The voice recognition will be done by HM2007 voice recognition module. The output from this module is then received by Arduino. The already written programs in the Arduino helps Arduino to convert this voice commands into considerable output and the wheelchair will move accordingly. By having a wheelchair control system people will become more independent. The wheelchair control system employs a voice recognition system for triggering and controlling all its movements. By using the system, the users are able to operate the wheelchair by simply speaking to the wheelchair's microphone. The basic movement functions includes forward and reverse direction, left and right turns and stop. The spoken words are linked to the voice recognition processor via a flexible microphone which can be bent as per the user's need. Many physically disabled patients cannot move any of the limbs below the neck.Hence manual and even joystick operated wheelchair are out of question for these patients. So thedevelopment of voice operated wheelchair will solve the query about the mobility of quadriplegic patient and make them independent of mobility.

OBJECTIVE

The main objective of our project is to help disabled people move around independently. This system will be a Real-Time Voice controlled Wheelchair for the physically disabled person.This system will be designed to operate the wheelchair based on the voice of the user and control the movement according to the command given by the operating person. The voice would be given through a mic and would be converted into text format by Google translator. Thus this text formatwould be checked, if true the command will be performed. More specifically, this system is designed to allow an admin and users to give the voice command to the wheelchair. These commands would be performed within seconds. On the whole its basic operation would be left, right, stop, go, back. Currently the whole operation of the wheel chair takes place by giving commands in Malayalam.

EXISTING SYSTEM

A speech controlled wheelchair for physically disabled person is developed which can be used for English Language. A speech recognition system using Mel Frequency Cepstral Coefficients (MFCC) was developed in the laptop with an interactive and user friendly GUI and the normal wheelchair was converted to an electric wheelchair by applying a gear mechanism to the wheel with DC motor attached to the gear. An Arduino Uno board is used to acquire the control signal from MATLAB and give it to the relay driver circuit which intern results in the motion of the wheelchair in the desired direction. The speech inputs such as forward, back, left, right and stop acquired from the user and then the motion of the wheelchair made according tothe respective command.

DISADVANTAGES OF EXISTING SYSTEM

- More processing time for voice recognition.
- Can be implemented only in English.
- Unable to find the best reference template for a certain word.

PROPOSED SYSTEM

The proposed system of the voice controlled wheel chair system uses the technology of speech recognition that incorporates Google translator. Considering one of the disadvantage of existing system that it can be used by only those people who know the English language. The proposed system can be implemented in any language as per the user preference. Currently we are implementing by providing directions in Malayalam language.

Also we are including a health monitoring section in our project, where the relative or the patient himself/herself can get the health details such as heartbeat, humidity and temperature through the Telegram app.

ADVANTAGES OF PROPOSED SYSTEM

- Better platform for the wheelchair control using considering the accessibility and comfortableness of the user.
- Can be employed in any language as per the user preference.
- Less expensive.

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- The patients like quadriplegic and cerebral palsy, lack of force, can easily handle thisvoice controlled system.
- The use of Arduino makes the programming of the system easy and thus, reducedthe software and hardware interfacing problems.
- The system is fully automated because of the use of Arduino and motor drivers.
- Can acquire the health details of the patient through the telegram application.

SYSTEM DESIGN

ARCHITECTURAL DESIGN

Below diagram shows the system block diagram showing the interconnections between each block or module of the system. All the modules are mounted onboard as to ease the wheelchair Fig 6.1.1

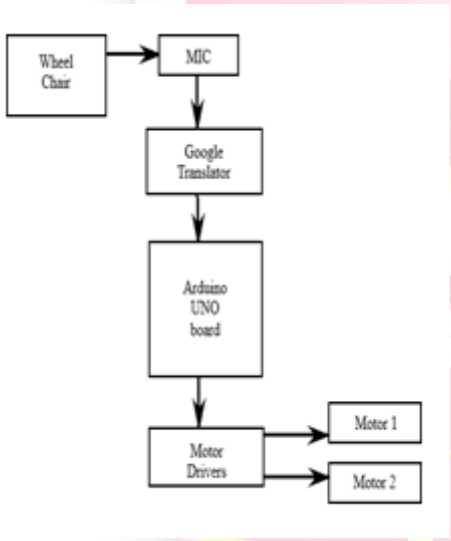

Fig 6.1.1 Block Diagram

movement. This includes a microphone which is located nearest to the user so as to make it handy and easy to use. Generally, the input voice level of the user affects the recognition accuracy of the command given result. Principally, the system is triggered by the voice command word.The working of the wheel chair is based on the voice recognition unit which is the heart of the system. There are five types of motions considered, moving forward, moving in reverse direction, moving to the left and moving to the right and stop. The direction of the wheelchair depends on the user. For the munnot command the wheelchair moves in forward direction. For moving in the reverse direction the opposite movement of wheel rotation will occur by giving pinnot command. The left command is dependent on the mechanism of the wheel ie. right wheel moves forward and left wheel moves backward and right command makes left wheel moves forward and right wheel rotate backward, this is achieved by using the idath and valath commands respectively. However all these commands are to be fed into the arduino uno board via PC/Laptop. The wheelchair system will go back to the stand by condition or end the whole system by giving the nirthu command.

MODULE DESCRIPTION

There are three main modules. These modules needed to be interconnected mutually in order to perform the wheelchair system efficiently.

a. Arduino Uno Board Module
b. Speech Recognition Module
c. Health Monitoring module

ARDUINO UNO MODULE

Arduino UNO Board, D.C Motors and L293D motor driver IC are the major hardware components used in this phase. All these components are interconnected to eachother by using the connecting wires. Also an Arduino IDE is used to carry out the coding part of this phase, in which the movement of the motors are controlled by the Arduino UNO board according to the user given commands. The input pins 1 2 3 & 4 of the L293D IC is connected to 4 5 6 7 digital pins of the Arduino Boardand then connect the L293D output pins to the motor. When the input pin of the Arduino is high, the corresponding output pin of the L293D is made high, so that the motor runs. The coding is done in C, to

facilitate the movement of the motors in different commands used such as forward, backward, right, left and stop. Once the coding is completed, it is uploaded into the Arduino Unoboard via a USB cable. On giving the following inputs, the motor runs accordingly:

- f => motor rotates forward.
- b => motor rotates backward.
- r => one motor rotates forward and the other rotates backward.
- l => one motor rotates backward and the other rotates forward.
- s => both the motors stop functioning

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SPEECH RECOGNITION MODULE

The main purpose of this phase is the conversion of the given speech input into text. Here we use a laptop as the processor and microphone to which the user speaks/gives the input command, which will be connected to each other. This will be then connected to the Arduino UNO board through COM 7 USB port, which uses a UART communication. The coding here is carried out in Python, which uses Python 2.7 version. The speech input which is in Malayalam will be given to the Google Translator that will convert into text. The output from the Google Translator will be then given as the input to the Python program. The program checks whether the given command is valid. If yes, it will be given to the Arduino otherwise an error message will be printed. The Arduino will rotate the motor according to the given command. Following are the input commands:

Input in Malayalam	Corresponding command in Arduino	Action/Function
Munnot	f	motor moves forward
Pinnot	b	motor moves backward
Valath	r	motor moves towards right
Idath	l	motor moves towards left
Nirthu	s	motor stops

Table 6.2.1: Working of the wheelchair

HEALTH MONITORING MODULE

Pulse Rate sensor and DTH11 sensor is used to measure the heart rate, temperature of the patient and the humidity of the room respectively. These measurement results will be then send as a message to the relative of the patient on the wheelchair through the Telegram application. Boththe sensors are connected to the Arduino Uno Board. Then install the Telegram app on the Mobileand also request the Bot Father to create a new Bot. We have named bot as wheel_chair and the username a s3h_bot. After this process the botfather will give you a Token for access. The heartbeat temperature and humidity will be sent as message to the telegram of the patient/relative, when they messages as status.

SCREENSHOTS OF RESULTS

Fig 8.2.1 Arduino Software

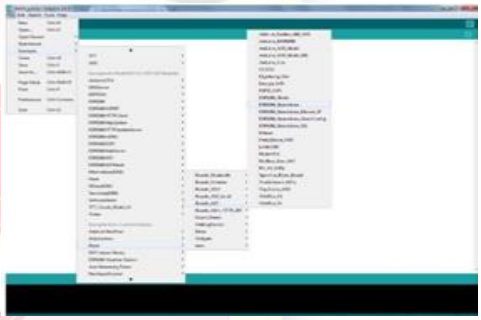

Fig 8.2.2 Upload the Firmware

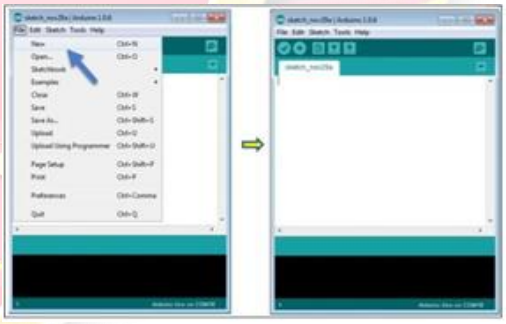

Fig 8.2.3 Creating a new project

Fig 8.2.4 Tool manager

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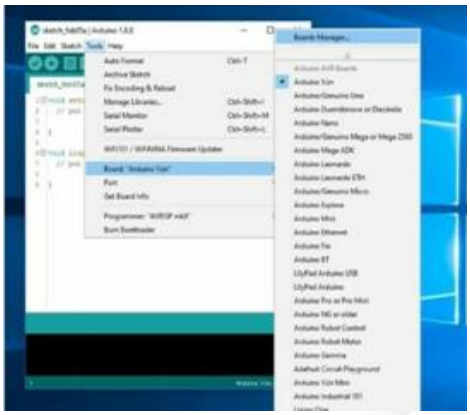

Fig 8.2.5 Arduino Board Selection

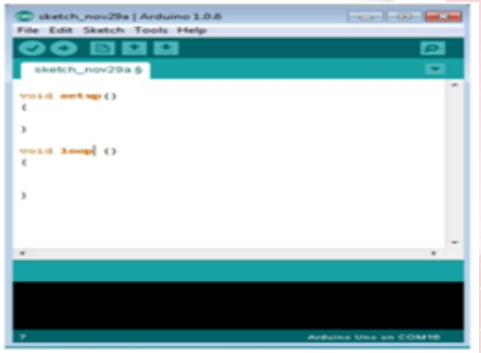

Fig 8.2.6 Ardiuno IDE Programming Window

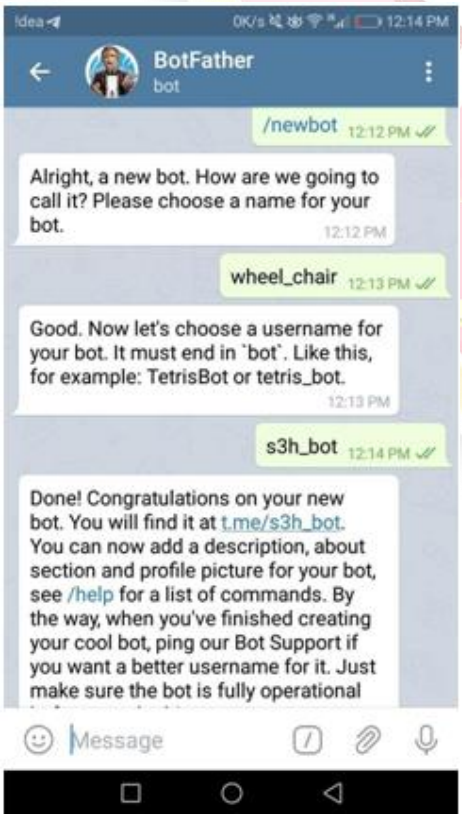

Fig 8.2.7 Create a new bot

Fig 8.2.8 Accessing token

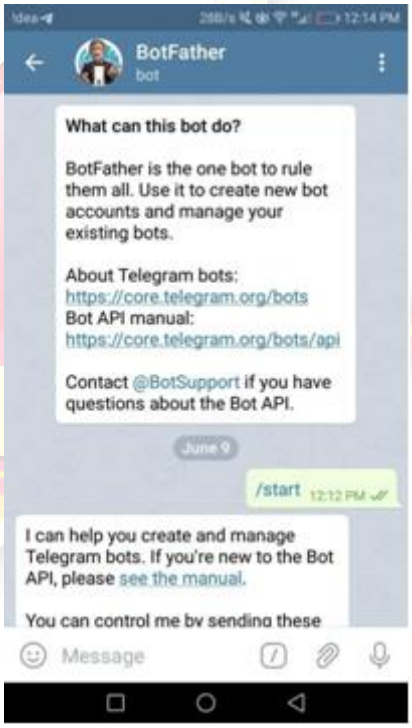

Fig 8.2.9 Telegram Output

CONCLUSION

We have proposed a novel isolated speech recognition technique, which provides efficient results using Google translator incorporated with Python programming and C programming. Apart from the movement of the wheelchair in desired directions by giving the commands in the Malayalam language, we have given an additional feature of health monitoringof the patient on the wheel chair. It provides the rate of heartbeat, humidity and temperature. This information will be shared with the relative of the patient through the mobile application Telegram. The design and implementation of a voice controlled wheelchair for disabled people using arduino and voice recognition module for controlling the motion of a wheelchair is designed. Thedirection of the wheelchair now can be selected using the specified voice commands. The designnot only reduce the manufacture cost compared with present market but also will give great competitive with other types of electrical wheelchair. The only thing needed to ride the wheelchair is the synthetic voice commands of the person. A system that can directly enhance the lifestyle of a physically disabled person in the community is implemented. The feasibility of proposed approach has been successfully tested on a real time wheelchair. The hardware response was also good as it didn't take much time from acquiring signal to generate control signal for motor control.

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Group Key Management for Secure Wireless Mobile Multicast

Aiswarya Mohan[1]
[1]Assistant Professor, Department of Computer Science and Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala

Abstract – Designing a centralized group key management with minimal computation complexity to support dynamic secure multicast communication is a challenging issue in secure multimedia multicast. In this study, the authors propose a Chinese remainder theorem-based group key management scheme that drastically reduces computation complexity of the key server. The computation complexity of the key server is reduced to O (1) in this proposed algorithm. Moreover, the computation complexity of group members is also minimized by performing one modulo division operation when a user joins or leaves. The operation is performed in a multicast group. The proposed algorithm has been implemented and tested using a key-star-based key management scheme and has been observed that this proposed algorithm reduces the computation complexity significantly.

Keywords: Multicast, group key management, complexity

I. INTRODUCTION

As group-oriented applications become increasingly popular, the need for confidentiality of group communications also grows. While there are many mature secure protocols for peer-to-peer communication, the scenario for group communication with dynamically changing members is very different. Efficient agreement on a new group key after user join or leave is crucial to group communication confidentiality [1]. During the past decade a variety of group key management protocols have been proposed. Among them are a set of efficient and scalable centralized group key management protocols based on certain hierarchical structure require about O (log n) of keys to be received, decrypted or computed, and stored by each individual group user for a group of n users. While this is already an improvement compared to previous schemes, it may still represent a large overhead for group users with limited capacity.

Designing a centralized group key management with minimal computation complexity to support dynamic secure multicast communication is a challenging issue in secure multimedia multicast.In this study, the authors propose a Chinese remainder theorem-based group key management scheme that drastically reduces computation complexity of the key server. The computation complexity of the key server is reduced to O(1) in this proposed algorithm. Moreover, the computation complexity of group members is also minimized by performing one modulo division operation when a user joins or leaves. The operation is performed in a multicast group. The proposed algorithm has been implemented and tested using a key-star-based key management scheme and has been observed that this proposed algorithm reduces the computation complexity significantly.

II. LITERATURE SURVEY

In this section, some of the existing group key management protocols and their drawbacks are discussed briefly.

Diffie-Hellman key exchange in [1], this protocol achieves secure and efficient key agreement in the context of dynamic peer groups, which are relatively small and non-hierarchical. Their protocol is efficient only for small groups and not suitable for large groups.

Secure group communications using key graphs [2]. Drawback is computation complexity is high.

An authenticated key management algorithm using Extended Euclidean algorithm [3]. Drawback is the rekeying cost is high for batch joining and leaving operations and also communication complexity is high.

Therefore, the major drawbacks of the existing system are: Computation complexity is high, Less confidentiality and security, Storage complexity is high, KS and group members computation complexity is high, Rekeying cost is high for batch joining and leaving operations [4], Communication complexity is high.In this paper, a novel GKM protocol for multiple multicast groups, called slot based multiple group key management (SMGKM) scheme is proposed. SMGKM supports the movement of single and multiple members across a homogeneous or heterogeneous wireless network while participating in multiple group services with minimized rekeying transmission overheads. Unlike conventional GKM protocols, SMGKM protocol can mitigate one-effect-n phenomenon, single point of failure and investment pressure of signaling load caused by rekeying at the core network. Numerical analysis and simulation results of the proposed protocol show significant resource economy in terms of communication bandwidth overhead, storage overheads at the Domain Key Distributor (DKD), mobile receiver and Area Key Distributors while providing intense security.

III. PROPOSED METHOD

In multicast communication, messages are sent from one sender to a group of members.This is helpful for sending and exchanging private messages among group members. Groups can be classified into static and dynamic groups. In static groups, membership of the group is predetermined and does not change during the communication. Therefore, the static approach distributes an unchanged group key (GK) to the members of the group when they join or leave from the multicast group. Moreover, they do not provide necessary solutions for changing the GK when the group membership changes which is not providing forward/backward secrecy.

When a new member joins into the service, it is the responsibility of the KS to prevent new members from having access to previous data.When an existing group member leaves from any group, he or she should not have further access to the multicast communication which provides forward secrecy. The backward and forward secrecy can be achieved only through the use of dynamic GK management schemes. In order to provide forward and backward secrecy, the keys are frequently updated whenever a member joins or leaves the multicast service. In this paper, we propose a new centralized GK management scheme based on the Chinese remainder theorem (CRT) to update and distribute the GK with less computational complexity to the multicast group members. In this proposed algorithm, the KS performs only one addition operation for updating the GK when a new user is joined in the dynamic multicast group. Similarly, it performs only one subtraction operation when an existing user is left from the multicast group. Moreover, each member of the multicast group is allowed to perform only one modulo division operation for recovering the updated key when there is a change in the multicast group. Therefore, our proposed CRT-based GK management (CRTGKM) algorithm takes less amount of computation. Complexity by slightly increasing the storage space of the KS.

The advantages of the proposed system are: Allows to split large modules exponentiation, Computational efforts can be reduced significantly, Provides elegant numbering for sequence, Efficient way to compute matrix exponentials, Large range interpolation is a special case. Figure 1 shows the architecture of the proposed system. The Group Key Management for Secure Wireless Mobile Multicast consists of four modules: super admin, group admin, group members and user modules.

A. Super Admin

Super admin can create groups, approve group admin, also send messages to every member in a group. As group-oriented applications become increasingly popular, the need for confidentiality of group communications also grows. While there are many mature secure protocols for peer-to-peer communication, the scenario for group communication with dynamically changing members is very different. Efficient agreement on a new group key after user join or leave is crucial to group communication confidentiality. Super admin

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can login, add new accounts, create new groups, share and view messages.

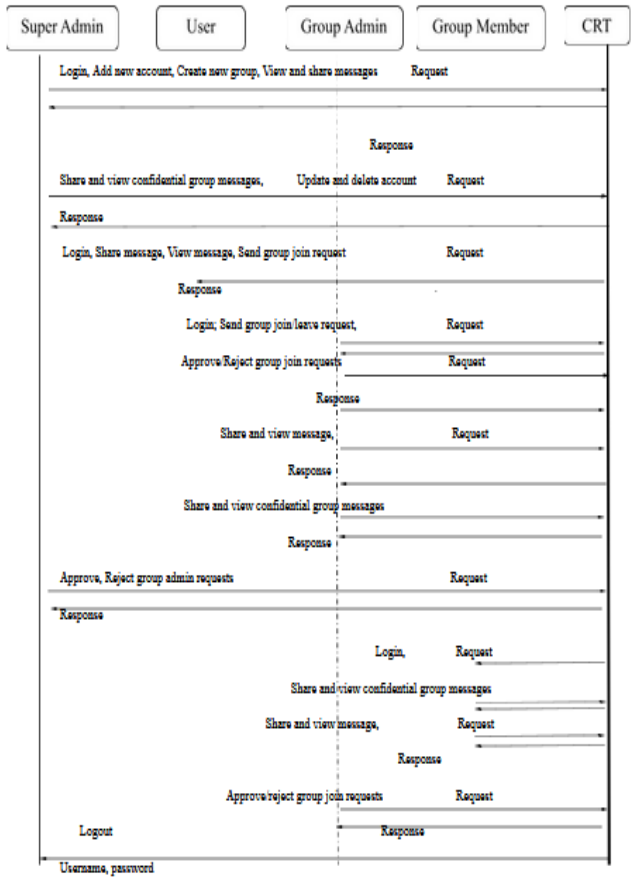

Fig.1. Architecture of the proposed method

Super admin can also share and view confidential group messages and can update and delete accounts. He can approve or reject group admin requests.

B. Group Admin

Group admin can approve group members, and message to every member in a group. Group admin can send confidential messages to members with the help of 3D password, CRT and Elgamal generated keys. Group admin can login, send group join or leave requests, approve or reject group join requests, and also can share and view confidential group messages. Group admin can approve or reject group leave requests.

C. Group Members

The third module is group member, who is the member of an individual group. Group members can also send confidential messages to members with the help of 3D password, CRT and Elgamal generated keys. System sends response messages to group members. Group members can share and view confidential messages and requests to the system, which inturn respond from system to group admin.

D. User

The fourth module is the User. The user can send messages to all participants in the system but it is not confidential. The user can send requests to join different groups. The user can login, share messages, view messages, and send group join requests.

IV. EXPERIMENTS AND RESULTS

The security in the multicast communication in the large groups is the major obstacle for effectively controlling access to the transmitting data. The IP Multicast itself does not provide any specific mechanisms to control the intruders in the group communication. Group key management is mainly addressed upon the trust model developed by Group Key Management Protocol (GKMP). There are several group key management protocols that are proposed, this paper will however elaborate mainly on Group key management which has a sound scalability when compared with other central key management systems. This paper emphasizes protocol which provides a scope for the dynamic group operations like join the group, leave the group, merge without the need of central mechanisms. An important component for protecting group secrecy is re-keying. With the combination of strong public and private key algorithms this would become a better serve to multicast security.

The multicast group can be identified with the class D IP address so that the members can enter or leave the group with the management of Internet group management protocol. The trusted model gives a scope between the entities in a multicast security system. For secure group communication in the multicast network, a group key shared by all group members is required. This group key should be updated when there are membership changes in the group, such as when a new member joins or a current member leaves. Along with these considerations, we take the help of relatively prime numbers and their enhancements that play a vital role in the

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construction of keys that enhance the strength for the security [5].Multicast cryptosystems are preferably for sending the messages to a specific group of members in the multicast group. Unicast is for one recipient to transfer the message and 'Broadcast' is to send the message to all the members in the network.

A. Key management

Multicast key management architectures include: Group Key Creation, Group Key Distribution, Group Rekey, Group controller, Group receiver, Group Key Deletion. It is desirable to be able to delete group members for either administrative purposes or security reasons. Administrative deletion is the deletion of a trusted group member. It is possible to confirm the deletion of trusted group members. Security relevant deletion is the deletion of an untrusted member. It assumes that the member ignores all deletion commands. Key management of secure group communication can be divided into three different categories: the first is called a centralized scheme with a central group controller (GC), the second is called a distributed scheme that without GC, and the third is called a decentralized scheme that can be regarded as the mix of previous two. In this paper, we focus on the first category. For the key management of secure group communication, there are many different approaches. In this paper, we will look at the problem by Chinese Remainder Theorem [6], namely a very fundamental mathematical point of view.

A.1.Chinese remainder theorem

Suppose m1,….,mn are pairwise relatively prime positive integers, and suppose r1,…,rn are arbitrary integers. Then the system of n congruences.

X≡ r1 (mod m)
X≡ r2 (mod m)
.
.
.
X≡ rn (mod m)

M has a unique solution modulo M = m1 … mn, which is given by

X=∑ i=1 to n ri yi Mi(mod M)Where,
Mi=M/mi
yi=Mi^-1(mod mi),for 1<=i<=n

Since Mi is relatively prime to mi there must exist a unique multiplicative inverse yi mod mi. Then the above computation of the unique solution X is well defined. Efficient computation of the multiplicative inverse can be carried out using Extended Euclidean Algorithm, which is the out of scope of this paper.

B. Key maintenance

The key server needs to store 2*n*-1 keys, i.e., *TEK* and *kij*($1 \le i \le log 2n$, $1 \le j \le 2i$)where *i* is the depth of the node in the tree and *j* is the ordinal number of the node in the *i*th depth of the tree, and each member needs to store $log 2n+1$ keys. The key server shares the keys with each member on the path from its leaf to the root.

C. Security

When routing is to be done in a Multicast, there isn't just the problem with the routing itself. A message doesn't just have to get to the recipient in a fast and accurate way, a recipient as well as the sender has to know that the message isn't tampered with, altered or read by unauthorized persons. There are numerous threats to a Multicast network and they all apply for a Multicast. Actually, they are even harder to solve and control. In multicast network basic functions like packet forwarding, routing and network management are done by all nodes instead of dedicated ones. Instead of using dedicated nodes for the execution of critical network functions you have to find other ways to solve this, because the nodes of a mobile multicast network can't be trusted in this way. The requirements are: confidentiality [7], integrity, authentication and non repudiation.

D. Solutions of security issues

All the above security mechanisms must be implemented in any multicast networks so as to ensure the security of the transmissions along that network. Thus whenever considering any security issues with respect to a network, we always need to ensure that the above mentioned for security goals have been put into effect and none (most) of them are flawed. Using authentication techniques during all routing phases exclude attackers and unauthorized nodes from participating in the routing by using digital signatures or some public key

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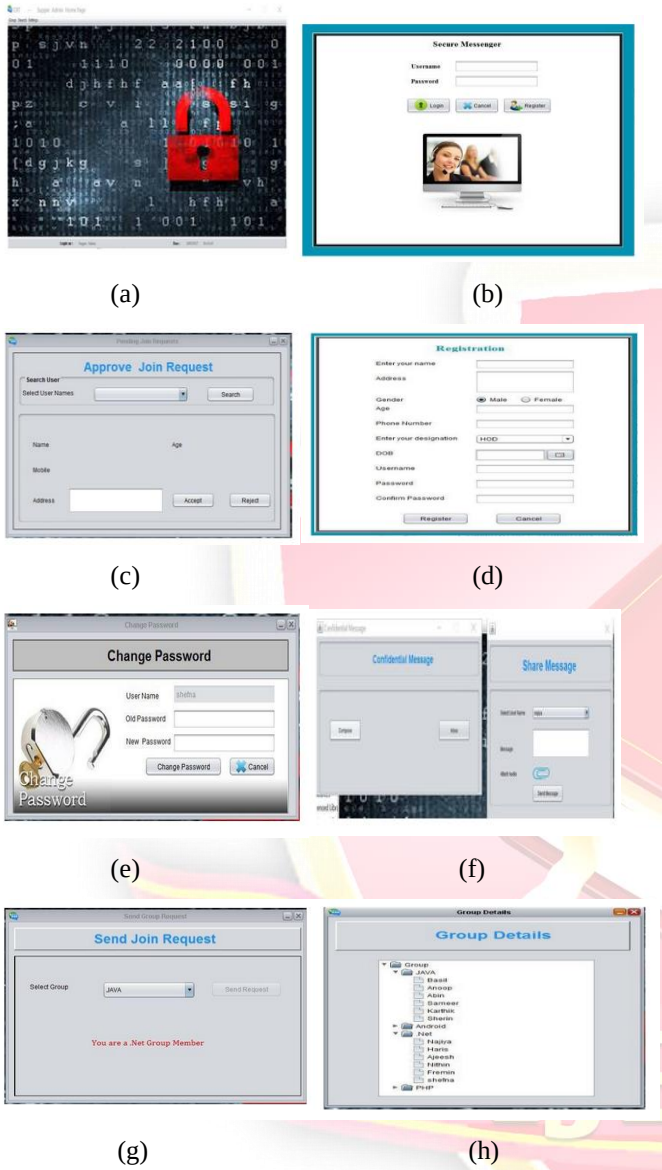
infrastructure (PKI) [8]. This can be done by cryptography techniques such as key systems. The results obtained are shown in Figure 2 below.



(a) (b) (c) (d) (e) (f) (g) (h)

Fig.2. (a)super admin home page (b) secure messenger (c) approve join request (d) registration (e) change password (f) confidential message (g) send join request (h) group details

V. CONCLUSION

In this system centralized, simple and efficient CRT based group key management and Elgamal protocols for small to medium size dynamically changing groups are used. The simple nature of protocols together with minimal requirements on user computation and key storage space make them suitable for a variety of secure group communication. Even though evaluate group performance using some O-notations, the unit operations of this protocols (mainly XOR, addition, multiplication and modulo arithmetic) is different from most of other protocols (mainly decryption, encryption and hashing) which can cause real performance results to be deviated. The future work will involve providing optimized implementation of this protocol to evaluate their real time performance and the comparison with other protocols.

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HYDROPHONIC SMART FARMING

Neethu Prabhakaran P[1]

[1]Assistant Professor, Department of Computer Science and Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala

Abstract-Cyber Physical Social System (CPSS), collaborative work between hydroponic farmers is now possible. hydroponic smart farming system that can be monitored online via app that is developed. The design that is created can monitor important parameters in the hydroponics system, such as light intensity, room temperature, humidity, pH, nutrient temperature, and TDS (Total Dissolved Solids).

The prototype is designed using Raspberry Pi3 that connects directly with sensors such as DHT11 module, LDR, pH sensor module, and TDS sensor. The app allows to monitor and control sensors online and also get live images of the system. With the integration of the Physical System (Raspberry Pi, sensor) and Social System (application) connected online via internet or cyber, the hydroponic system monitoring becomes more flexible.An application is developed for monitoring the system, chat with farmers and also control the sensors. In conventional hydroponics systems, monitoring plant environment conditions is done manually. Farmers manually still need to come to the hydroponic garden.

1.INTRODUCTION

Smart farming is an application of information and communication technology for monitoring farming system. It contains sensors for sensing the environment parameters. A study aimed to investigate an establishment using an Intelligent System which employed an Embedded System and Smart Phone for farming management and problem solving using Raspberry Pi and Arduino Nano.

There is also a study that developed a sensor-based automatic control mobile application for hydroponics. The application enables automatic environment monitoring for hydroponics with different types of sensors including temperature and humidity sensor, water temperature sensor, and light sensor. Another study showed about new aspect for organic farming through hydroponics. That research noticed the adoption of technology is open for productive organic farming practices. A breakthrough of technology is the concept of CPSS. CPSS is a combination between physical system and social system delivered through cyber or internet connection. Physical system contains sensors, actuators, and computer systems that do computation, while social means society that does communication to each other.

In a hydroponic system there are some factors that affect from growing of hydroponic plant. Light, temperature, humidity, pH, and nutrition are essential matter for growing plants in hydroponic system. Solution conductivity and temperature measurement are also an important factor to monitor in hydroponic system. In the green house, light can be supplied artificially using LED lamp or other light source besides sun light. The use of Raspberry Pi is needed to integrate all sensors. Implementing CPSS concept made hydroponic farmers possible to work in a group. Smart hydroponic farming system is the solution. Monitoring of the hydroponic environment parameters can be taken remotely. Also, monitoring activities can be done anytime and anywhere by its farmers. Some systems are needed to make the smart farming system work. The first is its own hydroponic system with the Nutrient Film Technique (NFT). The second is the physical system that consists of Raspberry Pi as a single board computer to do computation, sensors and actuators. The sensors that are used are light sensor, temperature and humidity sensor, and nutrition sensor. The third is an

application that acts as social media to take communication activities between each farmers.

An application is developed for monitoring the system, chat with farmers and also control the sensors. In conventional hydroponics systems, monitoring plant environment conditions is done manually. Farmers manually still need to come to the hydroponic garden. Then manually the farmers must also continue to monitor the condition of the plants. This becomes difficult if the farmer is not near his hydroponic garden, or weather conditions that do not allow the presence of these farmers. The design of a prototype that uses the concept of CPSS technology allows farmers to monitor the condition of the hydroponic system environment remotely and real time. This research tries to integrate between physical system and social system. The physical system consists of Raspberry Pi version 3 and the sensors.

The social system is by using an application. This application is developed by using Android Studio. Raspberry Pi, a single board computer, is used to integrate sensors that are connected. The app sends data to Firebase, a free of cost cloud messaging, and can retrieve the data too. Raspberry Pi stores the data and fetches it from Thing speak. This can help in analyzing data, as well as act upon it. Thepurpose of this research is prototyping hydroponic smart farming which could monitor the system through the app as CPSS. Prototype that is designed uses the app for CPSS implementation. Following the scenario, a group of farmers can use this app.

1.1 OBJECTIVES

In conventional hydroponics systems, monitoring plant environment conditions is done manually. This becomes difficult if the farmer is not near his hydroponic garden, or weather conditions that do not allow the presence of these farmers. Smart farming is an application of information and communication technology for monitoring farming system.

This is an Intelligent System which employed an Embedded System and Smart Phone for farming management and problem solving using Raspberry Pi and Arduino Uno. Monitoring of the hydroponic environment parameters can be takenremotely, anytime and anywhere by the farmers. Also the farmers can communicate each other with the help of an application developed.

Smart farming is an application of information and communication technology for monitoring farming system. It contains sensors for sensing the environment parameters. Using an Intelligent System which employed an Embedded System and Smart Phone for farming management and problem solving using Raspberry Pi. Hydroponic smart farming system that can be monitored online via an app that has been developed. The application enables automatic environment monitoring for hydroponics with different types of sensors including temperature and humidity sensor, water temperature sensor, and light sensor. A breakthrough of technology is the concept of CPSS. CPSS is a combination between physical system and social system delivered through cyber or internet connection. Physical system contains sensors, actuators, and computer systems that do computation, while social means society that does communication to each other.

In a hydroponic system there are some factors that affect from growing of hydroponic plant. Light, temperature,humidity, pH, and nutrition are essential matter for growing plants in hydroponic system. Solution conductivity and temperature measurement are also an important factor to monitor in hydroponic system. In the green house, light can be supplied artificially using LED lamp or other light source besides sun light.

The use of Raspberry Pi is needed to integrate all sensors. Implementing CPSS concept madehydroponic farmers possible to work in a group.

2.SYSTEM DESIGN

2.1 SYSTEM ARCHITECTURE

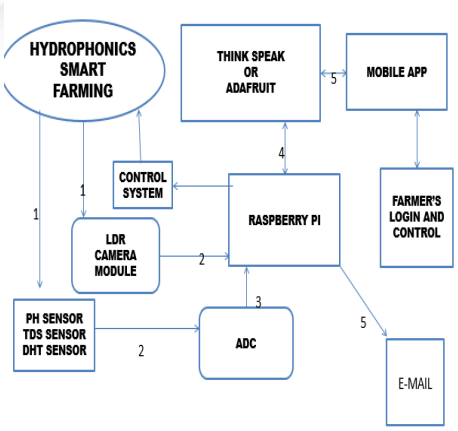

Figure 2.1 System Architecture

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2.2 MODULE DESCRIPTION

Mainly 5 modules are there these modules are used to control the plants growth and requirements automatically.
The modules are:

- User registration module
- User login module
- Sensors
- Control system
  - Controlling light
  - Maintaining Optimal Temperature For Plant Growth
- Interfacing sensors with Raspberry Pi
  - Interfacing Ph sensor
  - Interfacing TDS sensor v
  - Interfacing DHT11 sensor
  - Interfacing camera module
  - Interfacing peltier module

2.2.1 USER REGISTRATION MODULE

User Registration module is about the sign-up of account for the farmers to use the app. For using the app, each farmer must have an account registered in their name. They must provide a username and a password for the account.

The details that is provided by the users will be stored in Firebase that act as the server. It can also create an account for the app directly through Firebase itself. The data from the app can be analyzed from Firebase. Firebase gives you functionality like analytics, databases, messaging and crash reporting so you can move quickly and focus on your users. Firebase is built on Google infrastructure and scales automatically, for even the largest apps. These are the details that are verified to ensure authentication.

2.2.2 USER LOGIN MODULE

In user login module, a login screen will be displayed. The user will be greeted with a login screen for the first time he/she opens the application. The login portal consists of a username and a password. As discussed in user registration module, once the user has registered his account, they just have to enter their username and password to access the app's content.

The user has to enter a valid username and password. If not, the app cannot detect the user and will display "not found" message. Once a userenters the username and password, the app fetches data from Firebase. If the entered username and password is present in the server, then the user will have access to the contents. Otherwise, Firebase will send a message that the entered username and password is not found.

2.2.3 SENSORS

In a hydroponic system there are some factors that affect from growing of hydroponic plant. Light, temperature, humidity, pH, and nutrition are essential matter for growing plants in hydroponic system. Solution conductivity and temperature measurement are also an important factor to monitor in hydroponic system. The hydroponic farm consists of sensors such as the LDR module, the DHT11 module, the pH module, the Electro Conductivity module, and the camera module. With the monitoring system through this CPSS, it allows hydroponic farmers wherever and whenever to know the condition of plants in real-time. Monitoring includes monitoring of light, room temperature, humidity, pH, TDS and the temperature of solution or nutrients. In the green house, light can be supplied artificially using LED lamp or other light source besides sun light. The use of Raspberry Pi is needed to integrate all sensors.

PH meter is an electric device used to measure hydrogen-ion activity (acidity or alkalinity) in solution.

The PH value of the solution is controlled using a PH control system. The PH is continuously monitored by a PH sensor. The PH value is send to the control where set point is compared to the control value. If the values are not equal a signal is send to the control valve that applies carbon dioxide to the water. When the set point is reached the carbon dioxide flow is minimized. The PH values is continuously monitored to find the variations.

When carbon dioxide is mixed with water is produce carbonic acid and quickly decompose to form bicarbonate. This process is acidic so it can see a drop in PH.

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The DHT11 sensor includes a resistive-type humidity measurement component, an NTC temperature measurement component and a high-performance 8-bit microcontroller inside, and provides calibrated digital signal output. It has high reliability and excellent long-term stability, thanks to the exclusive digital signal acquisition technique and temperature & humidity sensing technology.

An LDR is a component that has a (variable) resistance that changes with the light intensity that falls upon it. This allows them to be used in light sensing circuits. It is basically a photocell that works on the principle of photoconductivity

Analog electrical conductivity meter V2 is specially used to measure the electrical conductivity of aqueous solution, and then to evaluate the water quality, which is often used in water culture, aquaculture, environmental water detection and other fields. This product, as an upgraded version of electrical conductivity meter V1, greatly improves the user experience and data precision. It supports 3~5v wide voltage input, and is compatible with 5V and 3.3V main control board; the output signal filtered by hardware has low jitters

The camera module is used to obtain the real time visual details of the plants. The Raspberry Pi Camera Module v2 replaced the original Camera Module in April 2016

The Camera Module can be used to take high-definition video, as well as stills photographs. It's easy to use for beginners, but has plenty to offer advanced users if you're looking to expand your knowledge

Submersible pump is a device which has a hermetically sealed motor close-coupled to the pump body. The whole assembly is submerged in the fluid to be pumped. The main advantage of this type of pump is that it prevents pump cavitation, a problem associated with a high elevation difference between pump and the fluid surface. Submersible pumps push fluid to the surface as opposed to jet pumps having to pull fluids. Submersibles are more efficient than jet pumps.

2.2.4 INTERFACING SENSORS WITH RASPBERRY PI

The Raspberry Pi 3 Model B features a quad-core 64-bit ARM Cortex A53 clocked at 1.2 GHz. This puts the Pi 3 roughly 50% faster than the Pi 2. Compared to the Pi 2, the RAM remains the same – 1GB of LPDDR2-900 SDRAM, and the graphics capabilities, provided by the Video Core IV GPU, are the same as they ever were. As the leaked FCC docs will tell you, the Pi 3 now includes on-board 802.11n WiFi and Bluetooth 4.0. WiFi, wireless keyboards, and wireless mice now work out of the box.

2.2.4.1 Interfacing ph sensor

- Just connect the pH sensor with BNC connector.
- The BNC connectors are used for coaxial cable.
- The BNC connector is connected with the PH2.0 (PH analog meter).
- Plug the PH2.0 interface into the analog input port of the Arduinonano controller.
- The analog reading in the analog inputs are converted into corresponding 10bit(0-1023).

Then these values are passed to the
raspberry pi

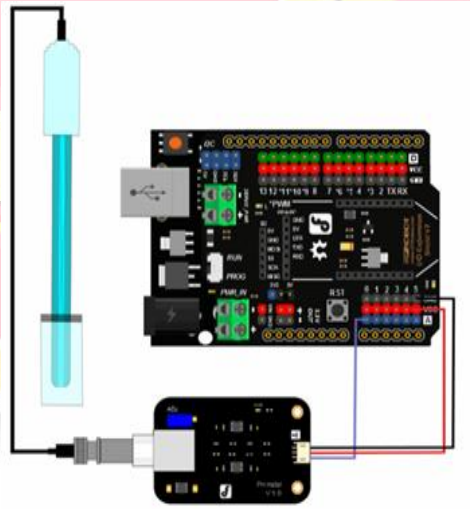

Figure2.1 Interfacing PH sensor

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2.2.4.2 Interfacing LDR sensor

- Connect the 3.3v output of the Arduino to the positive rail of the breadboard.
- Connect the ground to the negative rail of the breadboard.
- Place the LDR on the breadboard.
- Attach the 10K resistor to one of the legs of the LDR.
- Connect the A0 pin of the Arduino to the same column where the LDR and resistor is connected.
- Converts the analog voltage from 0-5V into a digital value in the range of 0-1023.

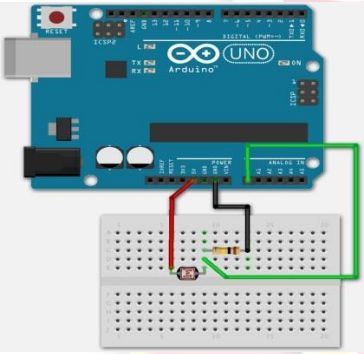

Figure 2.2Interfacing LDR sensor

2.2.4.3 Interfacing DHT11 sensor

- The DHT11 temperature and humidity sensor is a nice little module that provides digital temperature and humidity readings.
- The signal pin of the sensor is connected with the 7thpin(GPIO) of the raspberry pi.
- VCC of the sensor to the pin number 2(5v).
- Ground pin of the sensor is connected to the 6th pin in raspberry pi.

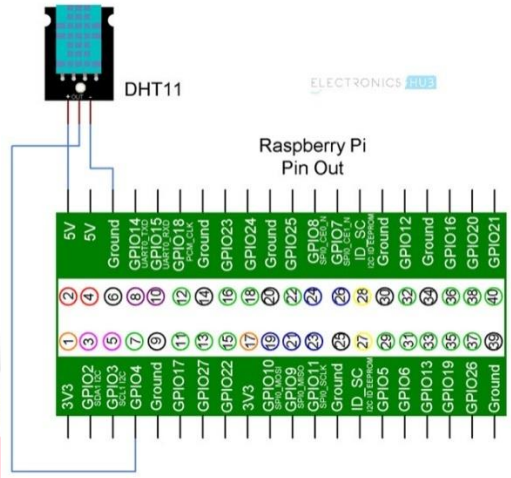

Figure .2.3 DHT11 sensor

2.2.4.4 Interfacing camera module

- Pi Camera module is a camera which can be used to take pictures and high definition video.
- Raspberry Pi Board has CSI (Camera Serial Interface) interface to which we can attach PiCamera module directly.
- This Pi Camera module can attach to the Raspberry Pi's CSI port using 15-pin ribbon cable.
- Open raspberry pi configuration using 'sudoraspi-config' command.
- Select Interfacing options in which select camera option to enable its functionality.

2.2.4.6 Interfacing peltier module

- Thermoelectric cooling uses the Peltier effect to create a heat flux between the junction of two different types of materials.
- A Peltier cooler, heater, or thermoelectric heat pump is a solid-state active heat pump which transfers heat from one side of the device to the other.
- Such an instrument is also called a Peltier device, Peltier heat pump, solid state refrigerator, or thermoelectric cooler (TEC)

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2.2.5 CONTROL SYSTEM

- Here in our Hydroponic Smart Farming system controlling both light and temperature.
- Since our smart farming system doesn't have any influence of the external climatic conditions we have to provide artificial light to the plants.
- It also have to maintain an optimal room temperature depending on the nature of plants.
- For providing artificial lights it can use LED or Fluorescent lamps.
- For maintaining temperature we use a combination of Peltier module, Heat sink and fan.

2.2.5.1 Controlling Light

- use LED strips for providing artificial lighting.
- In order to grow, plants need blue wavelength light for foliage growth and red wavelength light for flowering and fruiting.
- Plants have little use for green wavelengths and reflect them back, which is why leaves appear green.

control this LED using the mobile application

Figure 2.4 LED Strip

2.2.5.2 Maintaining Optimal Temperature For Plant Growth

- We use two peltier modules for hot and cold conditions.
- A peltier module produces heat on one side and cool on the other side.
- The heat side of the peltier module is connected to one side of the system
- The cool side is connected to the other side of the system
- The cool side is connected to the other side of the system

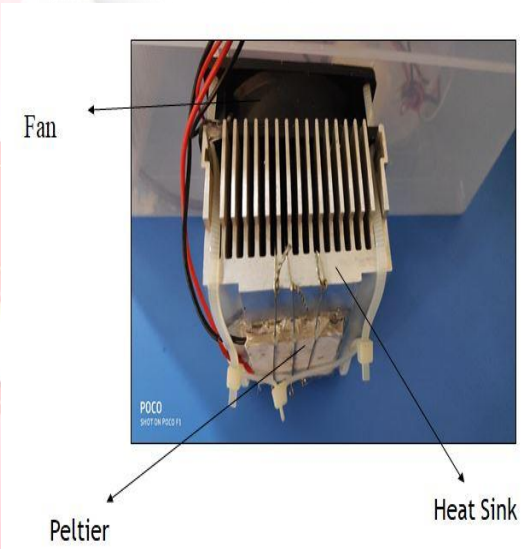

Figure .2.5 Temperature Controlling Unit

3.SYSTEM IMPLEMENTATION

System implementation is the process of defining how the information system should be built.For the implementation first we have to set up the raspberry pi.All sensors which IS used here to monitor and control the growth of the plant have to be interface with raspberry pi.

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4.RESULTS

4.1 SCREENSHOTS

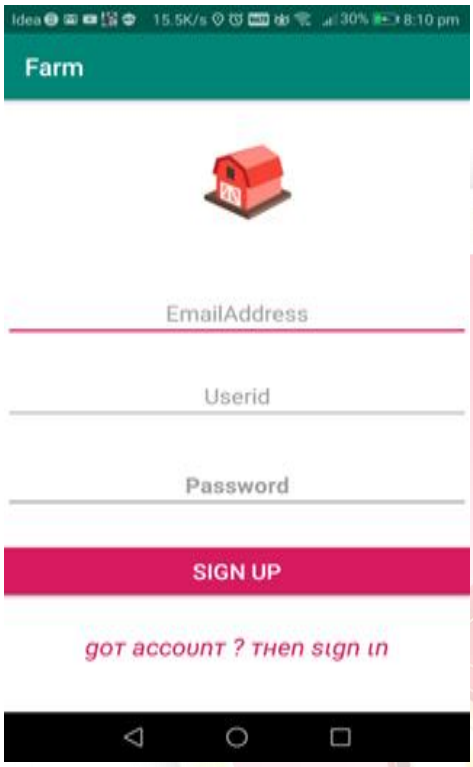

Figure 8.1 User Signup page

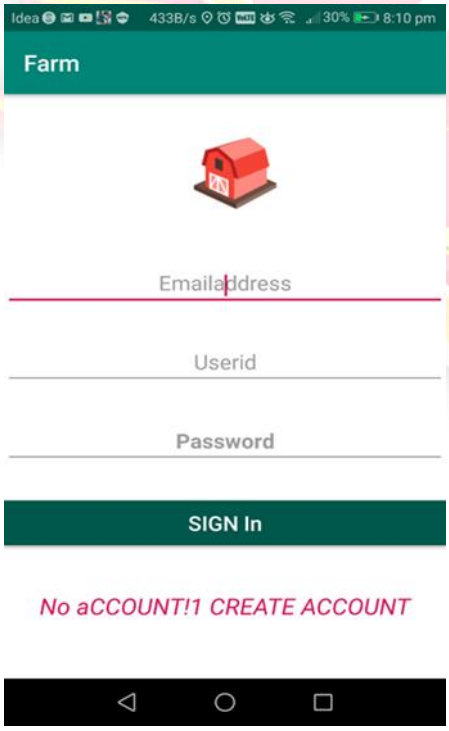

Figure 8.2 User Signup page

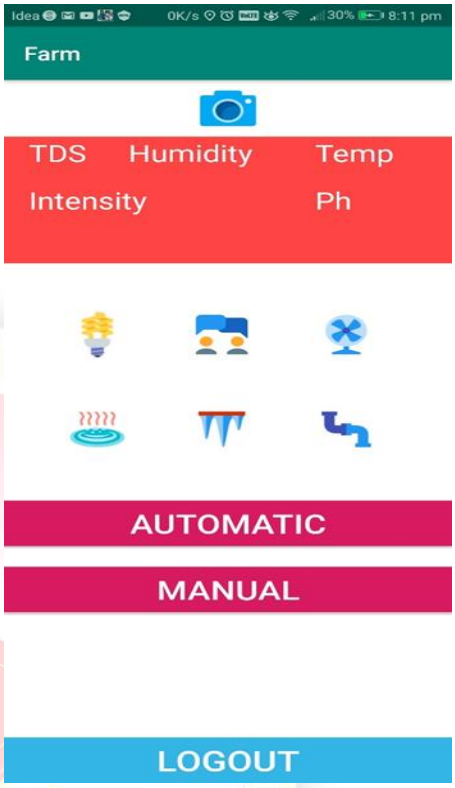

Figure 8.3 Chat box page

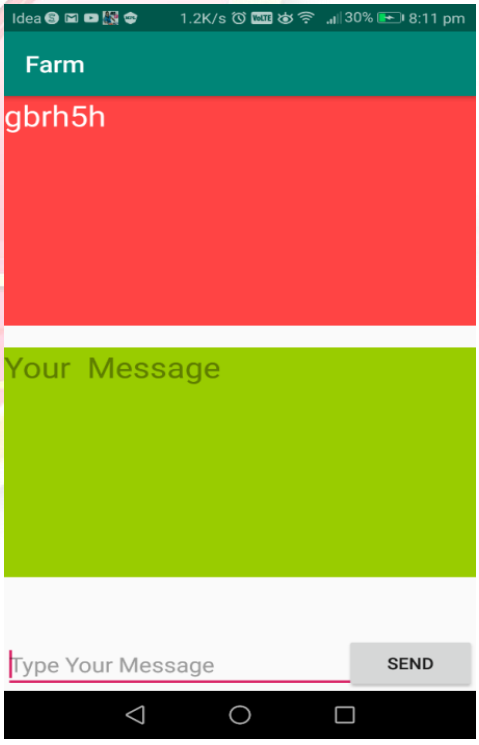

Figure 8.3 Home page

5.CONCLUSION

In conventional hydroponics systems, monitoring plant environment conditions is done manually. Farmers manually still need to come to the hydroponic garden. Then manually the farmers must also continue to monitor the condition of the plants. This becomes difficult if the farmer is not near his hydroponic garden, or weather conditions that do not allow the presence of these farmers. The design of a prototype that uses the concept of CPSS technology allows farmers to monitor the condition of the hydroponic system environment remotely and real time. With the monitoring system through this CPSS, it allows hydroponic farmers wherever and whenever to know the condition of plants in real-time. Application made Java based using the Android Studio platform. Monitoring conducted in this research includes monitoring of light, room temperature, humidity, pH, TDS and the temperature of solution or nutrients.

In a hydroponic system there are some factors that affect from growing of hydroponic plant. Light, temperature, humidity, pH, and nutrition are essential matter for growing plants in hydroponic system. Solution conductivity and temperature measurement are also an important factor to monitor in hydroponic system. In the green house, light can be supplied artificially using LED lamp or other light source besides sun light. The use of Raspberry Pi is needed to integrate all sensors. Implementing CPSS concept made hydroponic farmers possible to work in a group. Smart hydroponic farming system is the solution. Monitoring of the hydroponic environment parameters can be taken remotely. Also, monitoring activities can be done anytime and anywhere by its farmers.

An application is developed for monitoring the system, chat with farmers and also control the sensors. In conventional hydroponics systems, monitoring plant environment conditions is done manually. Farmers manually still need to come to the hydroponic garden.

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Trustworthiness of Artificial Intelligence

Shejina N M[1]

[1]Assistant Professor, Department of Computer Science and Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala

Abstract – This paper discusses the need for a trustworthy AI, along with the ethics which are required to keep that trust intact. AI has a lot ofbenefits when it comes to societal, individual or cultural development. But any mistake in either the development or in the working phase of the AI system can be disastrous, especially when human lives are involved. The main goal of this paper is to understand what really makes an Artificial Intelligence system trustworthy.

Keywords: Artificial Intelligence, ethical, lawful, robust, trustworthy, fundamental rights, democracy

I. INTRODUCTION

Artificial Intelligence is the most important innovation for the society which has the potential for improving the quality of living of humankind as a whole. It can be utilized in nearly every aspect of life of the people like healthcare services, public sectors, education, electronics, banking etc. The greatest contribution of AI will be to face and resolve the global challenges, given in the UN's Sustainable Development Goals(SDG), like giving quality Education, providing Clean Water and Sanitation, ending Poverty, Zero Hunger etc. For this purpose, innovation in the current AI system is of paramount importance for them to encompass a humane perspective and function in society to support and expand human welfare. For complete trust between the society and AI systems, improvement and innovation of both the internal architecture of the AIs and applications utilizing their Human Interface properties needs to be accomplished.

II. FRAMEWORK AND FOUNDATION OF TRUSTWORTHY AI

For successful development of framework for a reliable AI system, three criteria should be met for its development and its function.1. Lawful: The AI system should be compliant with various rules andlaws.2. Ethical: It should contain morals and ethics, and adhere to moral values andprincipals.3. Robust: AI should be sturdy in both social and technical sense.

Ethical issues of AI are field of applied moral values; it focuses on the various socio-technical discrepancies or issues generated due to the construction and function of AI. Ethical field regarding AI has significant value as it deals with problems like safety of individuals, dealing with the privacy of society and even unemployment due to AI. Ethical field will also explore the possibility of AI's influence on the society regarding the basic values, like the UN Development Goals. The main objective for the developers will be to integrate these systems on the common life with disrupting and existing social boundaries for maintaining sustainable order in the society.

III. RIGHTSASAFOUNDATIONFORTRUSTEDAI

[1] RESPECT FOR HUMAN DIGNITY AND INTEGRITY

An AI System developed should respect and protect human's moral code and their self-identity along with their personal sense of worth by not taking any unethical action in opposition of their ethics.

[2] FREEDOM OF THE INDIVIDUAL

Freedom of individuals means the full autonomous control over their rights, that can be rights to education, rights like privacy rights to express etc. An AI system

AI system should not change any current democratic processes, freedom of vote and laws of any country. AI system should also be aware enough for not taking any actions which can be detrimental to the principles that form the laws.

D. EQUALITY, NON-DISCRIMINATION AND SOLIDARITY

AI system should not function in any manner that supports racial issues, religion issues, gender discrimination and any other such unfair criteria. The system should be respectful to all, irrespective of their gender, religion andrace.

E. CITIZENS RIGHTS

AI system should be increasing the potential of the ability of various governments to enhance the innovation and efficacy of the public sector as well as the private sector for improvement of life for citizens.

IV. ETHICAL PRINCIPLES IN THE CONTEXT OF AI SYSTEMS

The way ethics play an important role in our daily lives, similarly, it is necessary to have ethics for AI systems in order to enable the systems to make quick, transparent and responsible decisions. Ethical principles for AI can serve a variety of functions in support of the users. Some of the ethical principles necessary for AI to achieve better outcomes, reduce the risk of negative impact and practice the highest standards of ethical business and good governance .

A. THE PRINCIPLE OF RESPECT FOR HUMAN CENTRED VALUES

The AI systems must not in any case dominate, force, deceive or manipulate human beings. Rather, they must be designed in such a way that they support, increase and accompany humans' social and cultural skills as well as their cognitive thinking. The AI systems must follow the design principles that have been creating supporting the human centric approach and there should always be an upper hand for humans regarding their functionality. The AI systems may also make changes in the working atmosphere aiming for the establishment of meaningful work keeping in mind the proposed limits set by humans.

B. THE PRINCIPLE OF PREVENTION OF HARM

An AI system must not intend or cause harm to a human being. This involves mental as well physical protection of human beings, while keeping their dignity. The safety and security of the environment in which the AI systems work must also be kept in mind, so that it is ensured that they are not used maliciously.AI systems should benefit individuals, society and the environment.

C.THE PRINCIPLE OF FAIRNESS

The motive behind using an AI system should be fair and must not include any bias decisions. The ulterior motive behind this principle is to mitigate the results obtained from a discriminate use of data in artificial intelligence.

D. THE PRINCIPLE OF EXPLICABILITY

Explicability comes from the word explicable meaning "capability of being explained". In order to build and maintain trust among users in AI systems, explicability is an important factor. The process through which AI works needs to be transparent, and the purpose of the AI system as well as the decisions made by it must be well understood by those affected, directly or indirectly. The extent to which an AI system is explicable is highly based on the context related to which the system is working.

E. PRINCIPLE OF PRIVACY PROTECTION AND SECURITY

AI system should respect and uphold privacy rights and data protection, and ensure the security of data.This includes ensuring proper data governance.
and management for all data used and generated by the AI systems.

V. TRUSTWORTHY AIREQUIREMENTS

A. HUMAN AGENCY ANDOVERSIGHT

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Fundamental Rights: AI systems have the capacity to equally support or hamper fundamental rights. For instance, they can balloon in the field of education, thus supporting someone's right to education. However the same AI system can negatively affect someone's fundamental rights. In such situations, proper fundamental rights violation assessment must be performed. This must be done before the development of the AIsystem.

Human Agency: There should be a flexible system between the user and the AI system.The user should have the necessary knowledge and tools in order to comprehend and make changes in the AI system according to their needs and goals. But this must be limited to a certaindegree.

Human Oversight: Human oversight can be beneficial.

B.TECHNICAL ROBUSTNESS ANDSAFETY

Resilience to attack: Just like any software, AI systems also have the vulnerability of getting attacked by adversaries (eg. hacking). In case an AI system is attacked by an adversary, there are chances that the AI system may respond differently and produce an unwanted output. It may even shut down. Hence, in order to mitigate this, the AI's security must be taken into account while designing and developing the AI system.

Fall Back Plan: Every AI system must have a fall-back plan in case a problem occurs. It must be ensured that the AI acts according to the proposed regulations towards its goal without harming any human being or the environment. The fall-back may include moving from a statistical approach to a rule based approach. The system may even take permission from the human operator before performing further tasks.

Accuracy: An AI system must be accurate enough to make correct judgements. This is very crucial at times and situations where human lives are at risk. Inaccurate predictions may lead to damage to property and loss of human lives.

Reliability and Reproducibility: An AI system must work with a variety of input in order to obtain different outputs, hence it must be reliable. Also, an AI task must produce the same output when repeatedly performed under the same conditions.

C. PRIVACY AND DATAGOVERNANCE

Privacy, Data protection: The information provided by the user and the personal information of the user must be kept safe by the AI system at all times. The AI system must not misuse it for any reason whatsoever.

Quality and Integrity of Data: Whenever any data is gathered by the AI system, there are chances that the data may be full of errors and mistakes. Feeding such type of data may change the system behaviour. The system must also reject any malicious data.

Access to Data: Not everyone must have access to the data collected by the AI system. Certain rules and regularities must be maintained regarding who will have access to this data and under what circumstances this data can be extracted.

D.TRANSPARENCY

Traceability: All of the information that the AI system gathers, stores or communicate between other systems or users, must be open to tracking for security purposes. This should be done under proper guidelines documented under the best possible standard. Traceability helps remove any errors in the decisions made by the AI system, and also prevents any futuremistakes.

Explainability: There must always be an explanation of why an AI system made a particular decision. There are some situations in which analysing a particular decision made by the AI system is necessary.

Communication:Every user has the right to know that they are interacting or communicating with an AI system. A user can knowingly choose to have a human based interaction with its AI system, but that too under certain conditions. Also, this must not violate any fundamental rights under any condition.

E. DIVERSITY, NON-DISCRIMINATION AND FAIRNESS

Avoidance of unfair bias: The information that goes through an AI system (whether that data is used to interact with the user or is used while developing the AI system) may contain some historical events that are related with biases in the past. This piece of information may continue to create various cultural, racial or sexual bias and prejudice in the future as well. In order to alleviate the problem, people from a diverse background may be hired while developing the AI system.

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Accessibility and Universal Design: Every AI system must have a fit-for-all design. This means that it must be designed in such a way so that it could be used by everyone, regardless of age, gender, mental or physicaldisabilities.

***F**. SOCIETAL AND ENVIRONMENTAL WELL BEING*

Sustainable and environment friendly AI: An AI system's design, development and usage processes must be performed in an environmentally friendly way. E.g. energy consumption during the AI's usage process must be tracked and kept under certainlimits.

Social impact: AI systems have the ability to alter our social lives, be it in areas of entertainment, work life or social life. They can not only make our social lives better, but can deteriorate it too. When it comes to AI's negative impact on our social life, they include both physical as well asmental effects. In order to mitigate this, the AI systems must be kept under observation and monitored regularly.

VI. REALIZATION OF A TRUSTWORTHY AI

A. TECHNICALMETHODS

Technical methods ensures that the trustworthy AI that can be employed in the development, designing and is utilized in all phases of an AI system. This architecture involves three step cycle for AI to be trustworthy:

- The sense step, involves recognition of all environmental factors necessary to follow all therequirements.
- The plan step, allows involvement of those plans that adhere to all the requirements.
- The act step, allows only those actions that are limited to behaviours realizing all the requirements.

A) ETHICS AND THE RULE OF LAW BYDESIGN

Law by design provides accurate and explicit links between the abstract principles which the system should obey and implement specific decisions. The norms should be obeyed for implementation of trustworthy AI system. It provides safe shutdown in case of failure and resume the operation after a forced shut-down.

B) EXPLANATIONMETHODS

Behaviour of system must be analyzed before interpreting its results for achieving a trustworthy AI system.

C) TESTING ANDVALIDATING

Testing and validation of the system must be provided as it ensures the system behaves as desired throughout its life cycle. It must include all components of an AI system, including data, pre-trained models, environments and the behaviour of the system as a whole. The output must be consistent with the final results of the preceding processes, while comparingthem with the previously defined policies to ensure that they are not violated.

This section elaborates different non-technical methods which plays an important role in maintaining and securing the AI.

A) STANDARDISATION

Standardisation of designs, business processing and manufacturing services act as a quality management system for AI by providing the users, organisations, research institutions consumers and governments with the ability to identify and encourage ethical code of conduct for their purchasing decisions

B) CERTIFICATION

The certifications apply standardised designs , manufacturing services developed for different application domains and align them appropriately in different contexts of industrial and societal standards. Certification cannot replace the responsibility. So it should be complemented by disclaimers as well as review, accountable frameworks and readdressedmechanisms.

C) CODES OFCONDUCT

An organisation should document its purpose and intentions when working with AI systems. Also it is supported standards of some expected values such as transparency, fundamental rights, and protection from harm.

D) ACCOUNTABILITY VIA GOVERNMENT FRAMEWORKS

Some governance frameworks should be established internally and externally by organization to account for the ethical decisions related to deployment, development and usage of AI system. Communication channels should also discuss dilemmas and

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report emerging issues incorporating ethicalconcerns.

E) EDUCATION PACT WITH AWARENESS TO FOSTER AN ETHICALMIND-SET

Trustworthy AI encourages the collaborative and instructed participation by all stakeholders. Communication, education and training are important factors for ensuring the potential impact of AI systems is known, and makes people aware as they have a vital part in shaping the society having AI Systems.

F) STAKEHOLDER PARTICIPATION AND SOCIAL DIALOGUE

AI systems offer huge benefits so it should be guaranteed that they are available to all .This requires discussions and dialogues between various social partners and stakeholders must also include the general public for their views.

G) DIVERSITY AND INCLUSIVE DESIGNTEAMS

The teams developing, designing ,testing, deploying ,maintaining, and procurement of AI systems takes into consideration the diversity of users and society in general. This ensures objectivity and contributions of various perspectives and needs. Generally, team diversity is not only in terms of gender, age, social group, culture but also includes skill sets , professional skills and background.

VII. ASSESSING TRUSTWORTHY AI

Development of evaluation criteria and administration step are to be done closely with the interested parties of the organisation like the stakeholders and government. Various small scale projects are to be performed first for getting the relevant feedback on the limitations of the current AI system.

Hard rules and limitations of AI's functions is to be outlined by referencing several factors like safety, advancement of AI and social acceptance of the people.

A. CLIMATE ACTION AND SUSTAINABLE INFRASTRUCTURE

AI influence on improvement or at least mitigation in climate change can have a great impact on society. AI systems can reduce the unwanted needs of resources by accurately monitoring and managing the data of relevant energy needs of the society. This will result in the development of efficient infrastructure and intelligent logistics.

Indirectly, by taking positive action for climate change, AI system can also reduce net amount of fatalities in the world. Additionally, the use of AI on medical sectors will also support the decrease in fatalities.

B. HEALTH ANDWELL-BEING

AI system can also have both direct and indirect effect on the medical and health sector. In a direct way, it can be used with various measuring instruments and life support devices to provide a high level of accuracy and control for aiding the doctors. Trust on the measurement of the AI devices and their lack of bias by the doctors can improve the present conditions of treatment exponentially.

In case of indirect influence, through the use of measurement recorded by the AI, doctors will be able to determine any potential diseases or problems in the patients and appropriate preventive measures can be taken.

C. QUALITY EDUCATION AND DIGITALTRANSFORMATION

AI systems can have the ability to estimate or predict the upcoming trends regarding the jobs availability, replacement of jobs due to better technologies and the measure of unemployment. All the above factors can be used by these systems to provide solutions like the skills needed for the new jobs, change in the present educational material and the business suggestions for reduction inunemployment.

AI stream will also be a great tool to restructure the Educational system to be more job oriented and adaptable to the individual strengths of students. Furthermore, using the power of internet, it will be used to provide quality education for children irrespective of their backgrounds.

D.IDENTIFYING AND TRACKING INDIVIDUALS WITH AI

As with the rise of various security measures like face ID, touch ID for sensitive work like banking or email signing, privacy of individuals becoming somewhat stable but with the AI system, these measures will also become obsolete due to the system's ability of face recognition and fingerprint scanning. For organisations and governments, breach of their privacy will be of direconsequences.

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Additionally, when dealing with digital entities there will certainly be a risk of hacking and AI systems will also share this disadvantage.

E. LETHAL AUTONOMOUS WEAPON SYSTEMS (LAWS)

Research on the autonomous weapons for war and defence are being done by nearly every country in the world. Certain risk factors are involved for this technology which can have dire consequences if not addressedproperly.

1. Hacking of the systems will become plausible by this research which will risk the safety of citizens all around theworld.
2. Malfunction of the AI systems is also a grave concern for this research. If the various ethical, legal and humanitarian values and issues are not clearly expressed to these AI systems, there is a possibility for them to have an autonomous interpretation which can be lethal for the society and their action can risk the safety ofpeople.

VIII. CONCLUSION

AI systems have numerous positive impacts in the present and will increase in the future, both on a personal level and a professional level, in various sectors like medical, educational, defence etc.But these systems also accompany equally large risks and negative impacts on the society. Therefore, development of the framework for the system through which they can be regarded as trustworthy is of paramount importance before their acclimatisation in the daily lives of people and organisations.

As discussed in this paper, a trustworthy AI should be 1) compliant with various rules and laws. 2) contain morals and ethics, and adhere to moral values and principals. 3) sturdy in both social and technical sense. For achieving this, a list of requirements are to be established based on sources like fundamental rights and various laws, for the AI system to work on human centric approach.

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PATIENT MONITORING SYSTEM USING GSM AND GPS, INTEGRATED WITH APPLICATION

Sniya Sukumaran[1], Reema Fathima[2], Rexcy Roy[3], Susmita Porel[4], Mithu Varghese[5]
[1,2,3,4]UG Student, Department of Computer Science and Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala, India
[5]Assistant Professor, Department of Computer Science and Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala, India

Abstract –The theme of this paper is to monitor the patients health parameters like ECG, Heartbeat, Temperature etc. by using different sensors and tracks the location of the patient. The message regarding the condition of the patient is sent to the doctor when it is abnormal. Sensors like heart beat sensor, temperature sensor ,ECG are interfaced with ESP8266 NodeMCU and also synced to the application. The location of the patient is traced using GPS module. All the parameter data of the patient are visualized by using LCD display. Patient can sync all the data to the application and also avail for necessary healthcare services such as direct communication with doctor, contact ambulance services and nearby hospitals, play sleep inducing music.

Keywords:ESP8266 NodeMCU, Temperature sensor, Heart rate sensor, ECG sensor, GPS module , GSM module.

INTRODUCTION

GSM based Patient Health Monitoring Project mainly works for allowing doctors or relatives of patient to check the status of patient health remotely. The system calculates the heartbeats and body temperature of patient and if it goes above certain limit then immediate informative alert message will be sent to the registered number. For this system we used microcontroller which isinterfaced with LCD display, heartbeat sensor, temperature sensor. The Patient healthmonitoring system works with GSM modem to send the data remotely to the registered number,system powered by 5V transformer. The system efficiently updates doctor about health of patientas well as accurately calculates the health parameter of patient. The system will track, trace, monitorpatients and facilitate taking care of their health. By using specific sensors, the data will be captured and compared with

aconfigurable threshold via microcontroller which is defined by a specialized doctor who follows thepatient; in any case of emergency a short message service (SMS) will be sent to the Doctor's mobilenumber along with the measured values through GSM module. Furthermore, the GPS provides theposition information of the monitored person who is under surveillance all the time. For patientswith insomnia, sleep inducing music can be played using the application. The patient can uploadtheir test reports to the application and doctors can view it.There is also provision forvoice call,video call and chat in the application.The system will be able tobridge the gap between patients and doctors. In the current pandemic situation, many lives are lostdue to the unavailability of proper treatment. This project will be helpful inovercoming the difficulties of the current scenario. People can make use of our app while sitting athome and not be bothered to go to the hospital unless there is an absolute necessary.

PROPOSED SYSTEM

A health care system along with a hardware through which the patients can check their health parameters and upload the measured values into database which can be viewed through the application. Application named "SMARTCARE"

developed through this project can be installed by the patient such that they get access to immediate healthcare services and virtually connect with the doctor. This can be a replacement for frequent unnecessary hospital consultation.

HARDWARE DESCRIPTION

1. Temperature sensor

This unit comprises of a temperature sensor which measures the temperature of the body and isconnected directly to a microcontroller. The temperature sensor that is used in this circuit is LM35DZfor the measurement of the body temperature. This temperature sensor is an analog sensor whichproduces an analog voltage by sensing the temperature. This sensor is held by the finger for a while(about 30 seconds or more) in order to measure the body temperature. The body temperature on the body surface is about 1 degree centigrade less than the temperature of other parts. The analog voltageproduced by the LM35DZ temperature sensor is directly proportional to the body temperature. Themicrocontroller receives the data in analog form and converts it into digital form then sends it to theGSM module so that the data can be sent to the remote end. The LM35DZ is a precision integratedcircuit temperature sensor that is used here to measure temperature. The electrical output voltageof LM35DZ is linearly proportional to the Celsius or centigrade temperature.

2. Node MCU

NodeMCU is an open-source Lua based firmware and development board specially targeted for IoTbased Applications. It includes firmware that runs on the ESP8266 Wi-Fi SoC from Espressif Systems,and hardware which is based on the ESP-12 module. The NodeMCU ESP8266 developmentboard comes with the ESP-12E module containing ESP8266 chip having Tensilica Xtensa 32-bit LX106 RISC microprocessor. This microprocessor supports RTOS and operates at 80MHzto 160 MHz adjustable clock frequency. NodeMCU has 128 KB RAM and 4MB of Flashmemory to store data and programs. Its high processing power with in-built Wi-Fi /Bluetooth and Deep Sleep Operating features make it ideal for IoT projects.NodeMCU can be powered using Micro USB jack and VIN pin (External Supply Pin). Itsupports UART, SPI, and I2C interface

3. GPS Module

GPS stands for global positioning system and can be used to determine position, time andspeed if you are travelling. GPS receiver module gives output in standard (National MarineElectronics Association) NMEA string format. It provides output serially on Tx pin with default9600 Baud rate.This NMEA string output from GPS receiver contains different parameters separated bycommas like longitude, latitude, altitude, time etc. Each string starts with '$' and ends withcarriage return/line feed sequence.The GPS allows to track the patients location andsends messages to doctor's when there is an emergency.

Fig1: GPS Module

4. GSM Module

A GSM modem or GSM module is a hardware device that uses GSM mobile telephonetechnology to provide a data link to a remote network. From the view of the mobile phonenetwork, they are essentially identical to an ordinary mobile phone, including the need fora SIM to identify themselves to the network. GSM modems typically provide TTL-level serialinterfaces to their host. They are usually used as part of an embedded system.A sim is to beinserted to use this module.

Fig 2: GSM Module

5. Heart beat sensor

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Heartbeat is measured with the help of fingertip sensor which consists of an infra-red (IR) lightemitting diode transmitter and an IR photo detecting receiver.The device utilizes optical technology to measure heartbeat of patient. As shown in the figure, boththe IR transmitter and receiver could be placed on the same plane and the finger would function as areflector of the incident light. The IR receiver monitors the reflected signal in this case. The IR filterof the photo transistor reduces interference from the mains 50Hz noise. The IR LED is forward biasedthrough a resistor to create a current flow. The values of resistors are chosen so that they canproduce the maximum amount of light output. This device also checks the oxygen level in the blood. The microcontroller processes the data received fromthe sensors. The light from bright LED collides with the tissues of the finger that is put above the bright LEDand the photo diode. The blood is continuously changing inside the tissues of the finger whichresults in the variation of blood due to which there is variation of reflected light that the photo diodeis going to detect. The bright LED and the photodiode are attached tightly so that they could havetight grasp while detecting the heartbeat. The resistor values are adjusted so that the optimum lightpasses through the finger which will enable the device to detect the heartbeat.

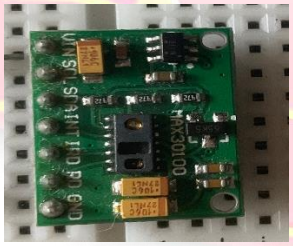

Fig3: Heartrate sensor

6. ECG

ECG records the electrical activity generated by heart muscle depolarization, whichpropagate in pulsating electrical waves towards the skin. Although the electricity amount is infact very small, it can be picked up reliably with ECG electrodes attached to the skin (inmicrovolts, or uV).The full ECG setup comprises at least four electrodes which are placed on the chest or atthe four extremities according to standard nomenclature (RA = right arm; LA = left arm; RL =right leg; LL = left leg). ECG electrodes are typically wet sensors, requiring the use of a conductive gel toincrease conductivity between skin and electrodes.

Fig 4: ECG sensor

8. Resistors

A resistor isa passive two-terminal electrical component that implements electricalresistance as a circuit element. In electronic circuits, resistors are used to reduce current flow,adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines,among other uses. High-power resistors that can dissipate many watts of electrical power asheat, may be used as part of motor controls, in power distribution systems, or as test loadsfor generators. Fixed resistors have resistances that only change slightly with temperature, timeor operating voltage. Variable resistors can be used to adjust circuit elements such as a volumecontrol or a lamp dimmer, or as sensing devices for heat, light, humidity, force, or chemicalactivity

9. Buzzer

The buzzer is a device which produces noise when the input value is greater than the thresholdvalue.

10. LCD Screen

The LCD screen is used to display all the sensor values.It also displays the necessary instructionsthat has to be followed by the user.

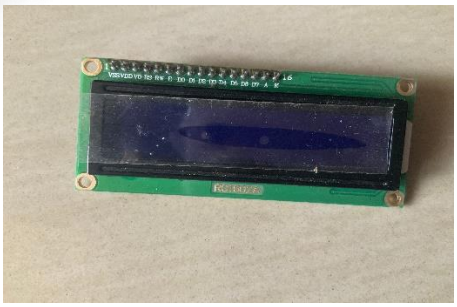

Fig 5: LCD screen

11. LED

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LED turns on when the value is greater than the threshold value.The LED is used as an indicator.

12.GPS Antenna

A GPS antenna is a device used for receiving and expanding radio signals sent by distinctfrequencies coming from GPS satellites. These antennas will convert them into electronicsignals so they can be used by GPS receivers. Once the GPS receiver obtains the outputfrom the GPS antenna, it can calculate the position accurately.

SOFTWARE DESCRIPTION

The user can treat their illness from home by installing theapplication on the phone. In case of an emergency, the patient canmake use of the application and consult doctor through the app. The patient canrecord their symptoms, also they can measure body temperature,heart beat , oxygen level and send it to the doctor for immediate care.The GPS system used in the application allows the tracking ofpatient's location. When there is a need of emergency whichrequires ambulance service, this location can be used to help thepatient. Unless there is no emergency, the patient can get treatment from the comfort of their home.Once the android application is installed on the phone,the user can use it anywhere at anytime.The app provides chat video call , voice call facilities .After all the data are uploaded to the application,the data are syncedusing a 'sync'button.The uploaded data can be then examined by thedoctor and various treatment methodologies are implied.If the dataseems to be greater than the threshold value,an alert is popped onthe screen,also a beep sound is produced.There are 4 modules in the software-patient,doctor,admin,hospital

1.PATIENT MODULE

In patient module,the patients can register using email id andpassword.To verify the authenticity of the user,a verification email willbe send to the registered email id.Once verified,the user is all set to usethe application.After logging in,the user can view and update themedical and personal information.According to the requirement ofthe patient,the doctor whom they want to consult can be chosen.Thepatient can then interact with the doctor.They can let the doctorknow of their symptoms.If needed,they can use the video callingservice to make the consultation more effective.The reportsuploaded by the patient can be viewed by the doctor and necessaryaction can be taken.If the user is an insomnia patient,the sleepinducing music are available in the application and can be played by them to fall sleep faster.Once all the data are measured, the sync button should bepressed to sync the software and the sensors.

2. DOCTOR MODULE

The doctors can login using their email id andpassword.Each time the doctor logs an OTP will be send to theregistered mobile number.The reports and data uploaded by thepatient can be viewed by the doctor.The doctor can give consultationvia chat,call or video call.Some patients who are undergoing certain medication may havevariations in heart rate or temperature which is completelynormal.So,the doctor can set the threshold according to the patientscondition.When a patient sends message to the doctor,the doctor isnotified.This allows the doctor to give immediate treatment to thepatient.In case of an emergency,a beep sound is send to the doctor. Facilities like offline voice call , online voice call , online video call and chat options are also available in this application for the doctor to communicate with patient.

3.HOSPITAL MODULE

The details of the hospitals are added in the hospital module. Hospitals can also add all the ambulance services they have and the location at which these ambulance services work. To make sure the identity of the ambulance drivers hospitals are given the authorization for adding ambulance driver details. Thecontact details of ambulance service are also provided by the hospitals.

4.ADMIN MODULE

The admin has complete control over the application. They can viewthe users who are using the application.Admin can bring updates tothe application.Debugging,software glitches and updates are handled by the admin.

ADVANTAGES

1. This system is really helpful when we need to monitor , record and keep track ofchanges in the health parameters of the patient over a period of time.

2. This system enables the doctor to study the variations of these parameters in the patient.

3. Hospital visits are minimized due to this patient monitoring system.

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4. Patient health parameter data is stored over the cloud. So it is morebeneficial than maintaining the records on printed papers kept in thefiles.

5) This system would be very convenient to patients who have undergone organtransplantations, kidney failure, recovered from minor heart attacks.

6) By receiving alert notifications doctor can provide urgent necessarytips and first aid to patients in case of emergency.

7) Doctors can also suggest diet, prescribe medicines through ourapplication.

8) Patients can reach doctor whenever they feel discomfort 24 x 7 service is available.

RESULT

The aim of the project is to constantly measure ,display and monitor the patient condition by using a set of biomedical sensors which has been successfully implemented . Thus the heartbeat ,Oxygen level ,temperature , ECG of the patient is also measured and displayed .Then location of the patient is accessed using GPS.If the patient's condition is abnormal,i.e. if the value is above the preset threshold then a message is sent to doctors registered mobile number via GSM indicating that patients conditions is critical along with readings from sensor and the location from the GPS. Patient and doctors can communicate in their comfort zones through chat, and lives call .we have also incorporated a buzzer and it will produce a alert sound ,when the obtained value from sensor is greater than the threshold value. The patient can sync all the data from the device to the application and store it in the cloud. They can make use of facilities like ambulance services and hospital details or they can contact the doctor through the app. And also insomnia patients can play sleep inducing music to fall sleep faster.

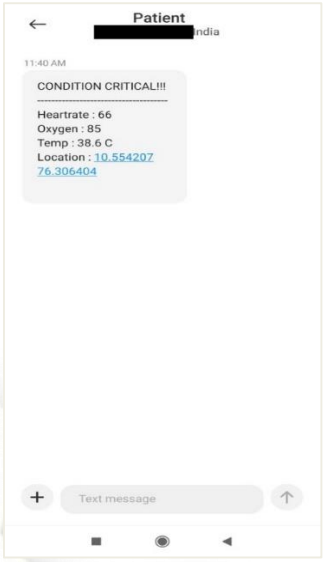

Fig 6: SMS received by doctor sent from GSM module

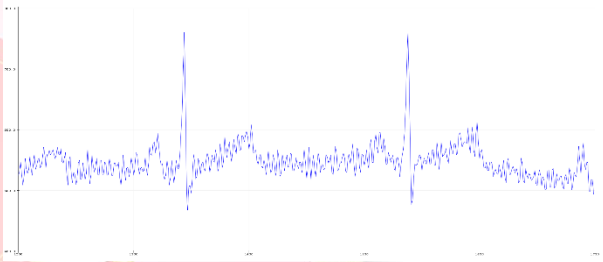

Fig 7: Output from ECG sensor

Fig 8: Output from heart rate sensor

Fig 9: Output from GPS Module

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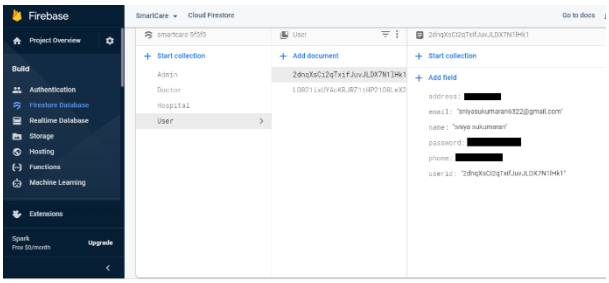

Fig 10: Values in database

CONCLUSION

Thus our group actively coupled with project ,and we develop this project named as "Patient Monitoring System Using GSM And GPS, Integrated With Application". Our system will be very helpful for tracking the health of patients and reduces the risk of travelling to hospitals during such pandemics .It would be convenient forpatients who have undergone organ transplantations ,kidney failure ,recovered from minorheart attacks.For getting the accuracy in sensor values we take the average of values whichprovides better accuracy .All the data synced from the hardware is stored in database which provides a record of patient data .Since the threshold value can be differentfor different patients ,doctors can change threshold value according to the patientscondition. Our system provides necessary facilities and features required for a patient atemergency .It provides a platform for patient to always keep in contact with the doctors theyneed.There would be no need to personally visit the medical centers for every minor issuesfor which the doctor can monitor and suggest ailments from afar.The device enable doctorsto better manage the patient condition. We contribute this project to virtual hospital concept.

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Detection and Classification of Bit-coin Transaction of Ransomware payments using Machine Learning Techniques

Shemitha P A[1], Dr. Julia Punitha Malar Dhas[2]

[1]Research Scholar, Computer Science and Engineering, Noorul Islam centre for higher education, Kannyakumari, India.
[2]Professor& Deputy Director (Research), Noorul Islam centre for higher education, Kannyakumari, India

Abstract: Ransomware transactions are mostly coming in crypto-currencies. In this paper we will explain the different approaches in machine learning for efficiently identifying and classify the Ransomware payments made in Bit-coin transactions. The machine learning approaches are evaluated based on the patterns differentiating such cybercrime operations from normal bit-coin transactions in order to identify and report attacks. The machine learning approaches are evaluated based on bit-heist Ransomware dataset. Experimental results shows that gradient descent algorithm achieved better detection rate when compared with k-nearest neighbor, random forest, naïve-bayes and multilayer perception approaches.

Keywords: *Block chain, bit-coin, cybercrime, Machine learning, Ransomware.*

I. INTRODUCTION

Bit-coin is crypto-currency introduced in 2008 by Satoshi Nakamoto. Bit-coin is the that the known crypto-currency. It had been introduced in 2009 using an open source code. It is a digital banking system without a physical banking central system without any specific country of origin. Bit-coin could be a decentralized type of payment system where the public ledger is properly supported in a distributed manner. The unknown anonymous candidate called miners, executing a protocol that maintains and extends a distributed public ledger that records Bit-coin transactions is called a block chain. Block chain is implemented as a chain of blocks. Bit-coin is the best-known crypto-currency industry.

The transactions of Bit-coin are completely digital and unknown to a great extent. This situation has led many cyber-crime perpetuators to use Bit-coin as a safe haven for illegal transactions such as Ransomware payments. Ransomware is malicious software that affects the payments gateway in return of ransom that has to be paid. Machine Learning approaches may be employed to pour over the previous transactions as training data in order to correctly predict the individuals or groups to whom Ransomware payments are being made. This paper tries to explore the efficacy of different machine learning approaches in detecting such payments.

II. RELATED WORK

There is a huge increase in the number of online users investing and trading Bit-coin. However, the obscurity by the crypto-currencies was misused by hackers or Ransomware operators. This paper aims to identify ransom payments in crypto-currencies, especially in terms of Bit-coins. I have conducted several studies.

Agcora et al [1] have utilized topological Ransomware data analysis techniques to automatically determine new malicious addresses within the Ransomware family. The authors have designed a Bit-coin graph model as a directed weighted graph. New addresses belonging to the Ransomware family are identified based on the payments made to the known addresses of Ransomware family. Initially, the Ransomware addresses are grouped into 20,000 groups. The resulting groups are then analyzed for any relation between Ransomware families. Both Topological Data Analysis(TDA) as well as DBSCAN

clustering algorithm are employed to detect and predict Ransomware transactions.

Liao et al [2] have performed analysis on Crypto Locker, a family of Ransomware. A framework which automatically detects the ransom payments made to Bit-coin address that belong to the Crypto Locker. The block chain analysis and data sourced from the online forums such as Bit-coin Talk were utilized to make measurement analysis on the data. The timestamps based on the ransom payments made by the victims are then extracted. Using this data analysis, the trends in the time series ransom amounts were paid were analyzed.

Conti el al [3] explored the safety and privacy issues in Bit-coin. The work mentioned how the veil of anonymity provided by the Bit-coin ecosystem is encouraging the cyber criminals to resort to illegal and banned activities such as Ransomware, tax evasion and money laundering.

Turner et al [4] have tried to research the transaction patterns of Ransomware attacks. The patterns are analyzed to collect intelligence to counteract the Ransomware attacks. Ransomware seed addresses were used to model a target network for pattern analysis. Different graph algorithms were used to analyze the cash-in and cash-out patterns. The show distinguishable ways related to the input and output side of the Ransomware graphs.

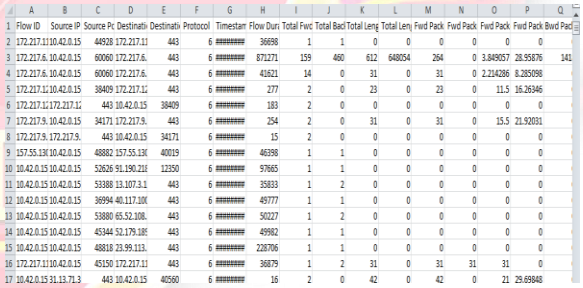
Huang et al [5] have performed measurement analysis of Ransomware payment data including the details regarding the victims as well as operators. A comprehensive dataset from multiple data sources such as Ransomware binaries, victim telemetry as well as vast list of Bit-coin addresses was formed. This data was used to Bit-coin-trail right from when the victim acquires Bit-coins to the point where the operators cash out the Bit-coins. The results claim improved coverage and detection of the Ransomware when compared with existing algorithms.

Alhawi et al [6] have proposed Net Converse which uses J48 primarily based decision-tree classifier to detect Ransomware samples from features that were derived from network traffic communications. Results show his approach returned better detection when compared to other conventional machine learning approaches such as Bayes Network, K-Nearest, Multi-layer perception, Random Forest and Logistic Model tree.

Poudyal et al[7] have proposed a framework for investigating Ransomware using machine learning techniques. Evaluation of the eight machine learning techniques has been conducted at two levels viz., assembly and dell programs. The results indicated that the Ransomware detection rate of more than 90%.

III. DATASET COLLECTION

The dataset for training the machine learning algorithms on the Ransomware payments over Bit-coin network is sourced from [1]. The dataset was taken from the Bit-coin transaction graph from 2009 January to 2018 Dec. Daily transactions from the network were extracted and therefore the network links having but zero less than 0.3 billion were filtered out as Ransomware amounts were typically on top of this threshold. The dataset contains twenty four thousand four hundred eighty six addresses selected from 28 Ransomware families.



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	Flow ID	Source IP	Source Pc	Destinati	Destinati	Protocol	Timestam	Flow Duri	Total Fwc	Total Bacl	Total Leng	Total Leng	Fwd Pack	Fwd Pack	Fwd Pack	Fwd Pack	Bwd Pac
2	172.217.11	10.42.0.15	44928	172.217.11	443	6	########	36698	1	1	0	0	0	0	0	0	
3	172.217.6.	10.42.0.15	60060	172.217.6.	443	6	########	871271	159	460	612	648054	264	0	3.849057	28.95876	141
4	172.217.6.	10.42.0.15	60060	172.217.6.	443	6	########	41621	14	0	31	0	31	0	2.214286	8.285098	
5	172.217.11	10.42.0.15	38409	172.217.11	443	6	########	277	2	0	23	0	23	0	11.5	16.26346	
6	172.217.11	172.217.1	443	10.42.0.15	38409	6	########	183	2	0	0	0	0	0	0	0	
7	172.217.9.	10.42.0.15	34171	172.217.9.	443	6	########	254	2	0	31	0	31	0	15.5	21.92031	
8	172.217.9.	172.217.9.	443	10.42.0.15	34171	6	########	15	2	0	0	0	0	0	0	0	
9	157.55.13(	10.42.0.15	48882	157.55.13(	40019	6	########	46398	1	1	0	0	0	0	0	0	
10	10.42.0.15	10.42.0.15	52626	91.190.21(	12350	6	########	97665	1	1	0	0	0	0	0	0	
11	10.42.0.15	10.42.0.15	53388	13.107.3.1	443	6	########	35833	1	2	0	0	0	0	0	0	
12	10.42.0.15	10.42.0.15	36994	40.117.10(	443	6	########	49777	1	1	0	0	0	0	0	0	
13	10.42.0.15	10.42.0.15	53880	65.52.108.	443	6	########	50227	1	2	0	0	0	0	0	0	
14	10.42.0.15	10.42.0.15	45344	52.179.18(	443	6	########	49982	1	1	0	0	0	0	0	0	
15	10.42.0.15	10.42.0.15	48818	23.99.113.	443	6	########	228706	1	1	0	0	0	0	0	0	
16	172.217.11	10.42.0.15	45150	172.217.11	443	6	########	36879	1	2	31	0	31	31	31	0	
17	10.42.0.15	31.13.71.3	443	10.42.0.15	40560	6	########	16	2	0	42	0	42	0	21	29.69848	

Fig1 – Dataset 'BitHeist'

The "Bit-coin-Heist Ransomware Address Dataset "contains nine descriptive attributes and a decision attribute. A summary of the dataset is given in Figure 1.

Attribute Id	Attribute Name	Attribute Type	Category/Description
1	Address	String	Address of the transaction. The transaction could be ransomware or white.
2	Year	Integer	Year of transaction as integer
3	Day	Integer	1 is and 365 is last day of the year
4	Length	Integer	Number of non-starter transactions on its longest chain.
5	Weight	Float	Sum of fraction of coins that originate from starter transaction and end up reaching the address.
6	Count	Integer	Number of starter transactions connected to the address through a chain
7	Looped	Integer	Number of starter transactions connected to the address with more than one directed arc.
8	Neighbors	Integer	Number of transactions which have the address as output.
9	Income	Float	Total number of coins output to the address
10	Label	String	The class to which the transaction belongs to. either white (non-ransomware) or ransomware (one of the 27 ransomware families)

Fig2 – Description of features

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The Bit-coin transactions have been developed as a Bit-coin Graph model with the help of a directed acyclic graph (DAG). Along with the Bit-coin address and its year and day time stamp, six other features also have been associated with the address. The attribute income is used to represent payment made in number of Bit-coins. The attribute length is employed to identify the number of non-starter transactions on the longest chain. A starter-transaction is any one of the sooner transaction in a 24-hour window which did not receive any payments. The attribute weight corresponds to the fraction of coins originating from the starter transaction and ultimately ending up at the corresponding Bit-coin address. The attribute length defines the quantity of non-starter transactions in its longest chain. The chain is enforced as a directed acyclic graph, originating from any starter transaction and ending at given address. Count attributes defines the quantity of starter transactions connected to the given address. Loop of an address is that the range of starter transactions connected to the address via more than one directed path.

Each of the transactions within the dataset are related to a label indicating whether thetransaction is white (benign) or belongs to one of the 27 Ransomware families. The dataset is a multiclass dataset which is extremely imbalanced in nature. A dataset is said to be imbalanced if the representations of various classes are roughly not equal.

The class distributions of the attribute label is represented in Figure 3. The percentage of imbalance of the foremost frequent Ransomware category viz., paduaCryptoWall with respect to the majority white class is 0.46%. The representation of other less frequent Ransomware families is almost negligible. Most of the conventional classifiers driven by accuracy-based evaluation metrics may fail in effectively predicting the Ransomware attacks. This work focus to study the effect of different classifiers in such extremely imbalanced data.

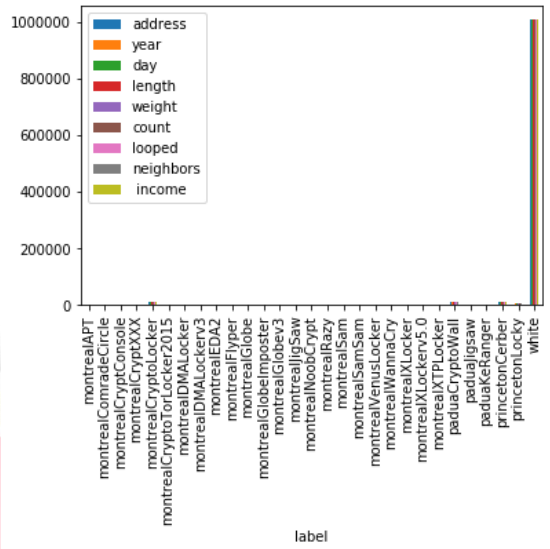

Fig 3 - Different Labels of BitHeist

Class	Label	Frequency	Class	Label	Frequency
0	white	2875284	14	montrealWannaCry	28
1	paduaCryptoWall	12390	15	montrealRazy	13
2	montrealCryptoLocker	9315	16	montrealAPT	11
3	princetonCerber	9223	17	paduaKeRanger	10
4	princetonLocky	6625	18	montrealFlyper	9
5	montrealCryptXXX	2419	19	montrealXTPLocker	8
6	montrealNoobCrypt	483	20	montrealCryptConsole	7
7	montrealDMALockerv3	354	21	montrealVenusLocker	7
8	montrealDMALocker	251	22	montrealXLockerv5.0	7
9	montrealSamSam	62	23	montrealEDA2	6
10	montrealGlobeImposter	55	24	montrealJigSaw	4
11	montrealCryptoTorLocker2015	55	25	paduaJigsaw	2
12	montrealGlobev3	34	26	montrealSam	1
13	montrealGlobe	32	27	montrealComradeCircle	1
			28	montrealXLocker	1

Fig 4 - The frequency Table

IV. EXPERIMENTAL RESULTS

All the experiments were conducted on Intel Core i7-6500U CPU 2.5 GHZ PC with 16GB of RAM running 64 bit OS machine. The implementation is completed using Python Programming language on Jupiter Notebook. The experiments on "Bit-coin Heist Ransomware address dataset" are performed with randomly selected 90% of the dataset as training data and remaining as validation data or testing data. Machine Learning Approaches.

A. Machine Learning Approaches

The machine learning approaches performed in this paper for building classification models for predicting the Ransomware attacks are Naïve Bayes, Random Forest, Multi Layer

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Perception, k-Nearest Neigbor, Graadient Boosting and XG Boost.

Naïve Bayes algorithm is based on the probability based Bayes theorem. The algorithm works on the principle of Class Conditional Independence. The class conditional independence states that the effect of other features. The posterior probabilities of the unknown instance with respect to every class label is estimated and the class label which maximizes this conditional will be the predicted class label.

Random Forest (RF) is an ensemble classification framework that is depends on the predictions from multiple weak learners, so as to form a one unified prediction. The ensemble approaches have been proven to perform higher than conventional classification approaches, and ease the issues faced by the individual constituent classifiers. Random Forest approach creates a set of multiple decision trees. The constituent decision trees are fed the data by applying random subset sampling on the instances as well as features. The predictions from these decision trees are aggregated to obtain the unified prediction.

Multilayer Perception (MLP) could be a neutral network primarily based classification approach that makes an attempt to learn the concept from the provided training data based on back propagation algorithm. The back-propagation algorithm searches for the weight values that minimize the error over the training instances. The algorithm repeatedly executes in two phases, forward and backward. Te forward pass evaluates the output using the weights of the neural network. The error with respect to the actual label is evaluated and weights associated with the neural networks will be adjusted supported this error. The process is recurrent in epochs until the remaining error becomes negligible.

k- nearest neighbor (k-NN) is a lazy learning approach in this the model for generalizing the provided training dataset isn't prebuilt before examining the unknown instances. K-NN represents the provided training instances on the feature space in terms of similarity measures. K-number is user specified parameter which selects the k number of training instance “closest” to a given unknown instance. The nearest neighbors are estimated using classical distance measures (Euclidean, Manhattan, or Minkowski) for continuous variables and hamming distance for categorical variables. Consensus among these measures provides the predicted class label for a given unknown instance.

Gradient Boosting is an ensemble learner that uses Decision Tree as base classifiers. The decision trees are added one at a time. Gradient Descent approach for minimizing loss function is used while adding the trees, whenever new base classifier is to be added, then its correlation with the negative loss function is evaluated. Those weak learners that are correlated are added.

XG Boost is an optimized version of Gradient Boosting algorithmic program. XG Boost has algorithmic as well as system enhancements over Gradient Boosting algorithm. The consecutive tree addition in Gradient Boosting is parallelized in XG Boost. Also, XG Boost constrains the growth of the constituent decision trees using maximum depth as a parameter. Hardware based optimizations also are enclosed by allocating cache buffers to store the gradient details. The usage of regularization methods like LASSO and Ridge more makes XG Boost superior to Gradient Descent algorithm.

Evaluation Metrics

The classification models recommended by the training algorithms can not be deployed directly as models derived from active learners suffer from the over-fitting drawback. The classification model is validated against a separate test dataset. Once the evaluation parameters for classification model are based on the confusion matrix. Confusion matrix is comprised of TP (True-Positive), TN (True-Negative), FP (False-Positive), FN (False -Negative).

The most analysis metrics evaluated are Accuracy, Precision, Recall and F1-Measures. Accuracy is outlined as proportion of total number of prediction made that are correct. True

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Positive Rate is measured as the ratio of correctly classified positive examples to the total number of positive examples. Precision is another widely used metric in information retrieval which estimates the percentage of relevant objects out of the retrieved ones. Recall corresponds to the number of relevant instances retrieved out of all relevant ones. F1-measure is the harmonic mean of Precision and Recall. Accuracy has been shown in many studies is biased towards majority class. In case of the Bit-coin dataset which is extremely skewed in nature, accuracy may not be considered as a good evaluation metric. Hence the results were drawn on the testing dataset for Precision, recall and F-measure values.

Results

The validation dataset corresponds to 10% of the randomly sub-sampled instances from the Bit-coin Ransomware dataset. The addresses are well as the class label attributes of the entire dataset have to be transformed using Label encoding process for some classification algorithms to begin modeling data. The resulting class label and the frequency counts of individual class labels are provided in the result tables for clear understanding. The validation dataset also can be noticed as extremely imbalanced in nature. The results in terms of Accuracy, Precision, Recall and F1-measure are depicted in Figure 5.

Class	Accuracy	Average Precision	Average Recall	Average F-Measure
Naïve Bayes	0.38	0.98	0.38	0.55
Random Forest	0.99	0.99	0.99	0.99
Multi Layer Perceptron	0.99	0.97	0.99	0.98
k-Nearest Neighbor	0.98	0.98	0.98	0.98
Gradient Boosting	0.99	0.99	0.99	0.98
XGBoost	0.99	0.98	0.99	0.98

Fig 5 – Accuracy of different classifiers

The above figure shows that Naïve Bayes Classifier did not perform well on the dataset whereas other classifier return good values.

The k-nearest neighbor algorithm was able to correctly identify instances belonging to the minority classes. K-NN is a lazy classifier which postpones the classification task until the unknown instance is provided. The prediction is based on the consensus from 'k' similar training instances. It may be observed that k-NN correctly identifies fraud classes better than MLP and naive Bayes classifiers. Random Forest is an ensemble formed from base classifier of decision trees. The weak learners are trained on the data obtained by applying random subset ambling on the set of instances and features as well. This process ensures least correlation among the constituent decision trees. The class imbalance did not have as much effect on Random Forest as it did on Naïve Bayes, MLP and k-NN algorithms. It may be observed that Gradient Boosting classifiers considered. Both Gradient Boosting and XG Boost algorithms use sequential process such that every time an instance is incorrectly classified, more focus is provided to such instances. The gradient Boosting algorithms may provide better classification results to the minority class.

V. CONCLUSIONS

This paper investigates the effect of different supervised machine learning approaches for effective identification of Bit-coin payments for Ransomware perpetuators. Dataset considered is a multi-class extremely imbalances in nature. Results on different evaluation metrics indicate that the Gradient Boosting and XG Boost algorithms correctly identified more of the attack classes than other classifiers considered namely Naïve-Bayes, Multi-layer Perception, k-NN and Random Forest classifiers. The findings of the algorithms need further exploration on the datasets having extreme class imbalances as well. More emphasis may also be provided to classifiers which consider the representatives of the minority classes from the training data for making better reductions. Future work may also be done to validate the results on more recent spurious Bit-coin transactions involving cybercrime such as Ransomware payments and money launder.

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SOFTWARE-DEFINED NETWORK

JENSY VARGHESE[1], DR. M.VICTOR JOSE[2]
[1]Assistant Professor /CSE, [1]RCET, AKKIKKAVU
[2]ASSOCIATE PROFESSOR/MCA,,[2] NICHE, KUMARAKOIL

Abstract. Software-defined networking technology is an approach to network management that enables dynamic programmatically efficient network configuration in order to improve network performance and monitoring, making it more like cloud computing than traditional network management. It provides a framework to dynamically adjust and reprogram the data plane with the use of flow rules. The realization of highly adaptive software-defined networks with the ability to respond to changing demands or recover after a network failure in a short period of time hinges on efficient updates of flow rules. To model the time to deploy a set of flow rules by the update time at the bottleneck switch, and formulate the problem of selecting paths to minimize the deployment time under feasibility constraints as a mixed-integer linear program. To reduce the computation time of determining flow rules, we propose efficient heuristics designed to approximate the minimum-deployment-time solution by relaxing the Mixed Integer Programming or selecting the paths sequentially. Through extensive simulations, we show that our algorithms outperform current, shortest path based solutions by reducing the total network configuration time

Keywords—SDN: Software-Defined Networking, TCAM: Ternary Content-Addressable Memmory, IP: Internet Protocol, IoT: Internet of Things.

INTRODUCTION

SDN is widely recognized that flow configuration of flow forwarding rules at the SDN switches, is critical for SDN operation. Configuration updates due to changed flows must be performed consistently and quickly to avoid congestion delays, loops, and policy violations. The need to re-establish disrupted flow caused by failing links as the result of a failure, congestion or attack on the network infrastructure, motivates the requirement to perform fast network reconfiguration. The Time required for deploying a given flow configuration is dominated by the time to insert/update flow rules in the ternary content addressable memory of each involved switch. Hardware reigned supreme in the networking world until the emergence of software-defined networking (SDN), a category of technologies that separate the network control plane from the forwarding plane to enable more automated provisioning and policy-based management of network resources. It is an approach to network management that enables dynamic, programmatically efficient network configuration in order to improve network performance and monitoring, making it more like cloud computing than traditional network management.SDN has evolved into a reputable networking technology offered by key vendors including Cisco, VMware, Juniper, Pluribus, and Big Switch. The Open Networking Foundation develops myriad open-source SDN technologies as well. The idea of programmability is the basis for the most precise definition of what SDN is: technology that separates the control plane management of network devices from the underlying data plane that forwards network traffic. IDC broadens the definition of SDN by stating: “Datacenter SDN architectures feature software-defined overlays or controllers that are abstracted from the underlying network hardware, offering intent-or policy-based management of the network as a whole. This results in a data center network that is better aligned with the needs of application workloads through automated (thereby faster) provisioning, programmatic network management, pervasive application- oriented visibility, and where needed, direct integration with cloud orchestration platforms.”

BACKGROUND

Software-defined network (SDN) controllers which include mechanisms to globally reconfigure the network in order to respond to a changing environment. As demands arrive or

leave the system, the globally optimum flow configuration changes over time. Although the optimum configuration can be computed with standard iterative methods, convergence may be slower than system variations, and hence it may be preferable to interrupt the solver and restart. In this paper, we focus on the class of iterative solvers with an exponential decrease over time in the optimal gap. Assuming dynamic arrivals and departures of demands, the computed optimality gap at each iteration is described by an auto-regressive stochastic process. At each time slot, the controller may choose to1) stop the iterative solver and apply the best found configuration to the network or 2) allow the solver to continue the iterations keeping the network in its sub-optimal form. Choice1) reduces the optimality gap leading to smaller routing costs but requires flow reconfiguration which hurts Quos and system stability. To limit the negative impact of reconfigurations, we propose two control policies that minimize the time-average routing cost while respecting a network reconfiguration budget. We experiment with realistic network settings using standard linear programming tools from the SDN industry. In the experiments conducted over the GEANT networks and fat-tree networks, our policies provide a practical means of keeping the routing cost small within a given reconfiguration constraint. Software-Defined Networking enables efficient utilization of network resources by dynamically adapting the routing configuration over time. In this context, this paper addresses an important question about the interplay between the high degree of configuration flexibility and the computational limits of the SDN controller logic. Specifically, examine the problem where the optimality gap of iterative routing algorithms decreases exponentially fast and we want to minimize the average routing cost subject to a constraint for the average reconfiguration frequency. Furthermore, we present two control policies working on top of the online routing optimization engine to decide whether to apply or not the current yet not optimal global network configuration. Numerical results on the GEANT network and fat-tree network topologies show that our control schemes can effectively track the evolution of the system using a bounded number of reconfiguration, thus pursuing the double objective of optimizing the performance and the system stability. The problem of consistently increasing the flow of traffic between a source and a terminal node, while keeping allother traffic flows intact. Current methods such as RSVP-TE consider unsplittable flows and assign weights according to the importance of the flow. To cope with this, the changing data flows get sent through the network by routing algorithms in a greedy (shortest path) way that favors distributed fault- tolerance over efficiency. While this makes sense in a scenario where the network is controlled by various independent participants. The situation changes when the network is controlled by one entity. With only one logical central controller, it is possible to actually reclaim the control over the general behavior of the network and just leave the menial task of data forwarding localized in the switches and routers. This is one of the fundamental ideas that gave rise to these ideas. But, while in this system the new network behavior might be optimal, what happens during the migration to the new behavior? Clock synchronization is far from perfect, and even if, some switches will straggle (taking up to 100 longer than average to update in practice) or might not be available to the central controller at all for some time. This inherent asynchrony will lead to over-utilization of links, inducing congestion, and thus packet loss is raised here. Also studied consistent migration of flows, with a special focus on software-defined networks. Given a current and a desired network flow configuration and give the first polynomial-time algorithm to decide if a congestion-free migration is possible. However, if all flows must be an integer or are unsplittable, thisis NP-hard to decide. A similar problem is providing increased bandwidth to an application while keeping all other flows in the network, but possibly migrating them consistently to other paths. It shows that the maximum increase can be approximated arbitrarily well in polynomial time. Current methods as RSVP-TE consider unsplittable flows and remove flows of lesser importance in order to increase bandwidth for an application: So prove that deciding what flows need to be removed is an NP-hard optimization problem with no PTAS possible unless P = NP. A new algorithm for SDN network updates that preserve forwarding policies. FLIP builds upon thedualism between replacements and additions of switch flow- table rules. It identifies constraints on rule replacements and additions that independently prevent policy violations fromoccurring during the update. Moreover, it keeps

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track of alternative constraints, avoiding the same policy violation. Then, it progressively explores the solution space by swapping constraints with their alternatives, until it reaches a satisfying set of constraints. Extensive simulations show that FLIP outperforms previous proposals. It achieves a much higher success rate than algorithms based on rule replacements only, and massively reduces the memory overhead with respect to techniques solely relying on rule additions.

SYSTEM DESCRIPTION

Software-defined networking (SDN) separates the control from the data plane in network devices, like switches and routers. This new concept suggests the use of a centralized controller that determines the behavior of all forwarding components in the network. Southbound interfaces permit communication between the control plane and the data plane, while northbound interfaces provide enormous possibilities for networking programmability, like creating applications that can automate all networking tasks. Consequently, SDN will enhance creativity, as well as innovation, in the domain of networking. Three critical requirements are not achievable in an SDN-enabled centralized network, which was the main tendency for early proposed SDN architectures, using just one controller: first, efficiency that is not enough established with just one centralized controller, second, scalability that is one of the most issues that pushes network architects to consider the idea of multi controllers, and, third, high availability, which has two items, redundancy, and security. Redundancy is one of the most significant aspects of any design. One controller could fail anytime and, for this reason, abandon the network without its control plane. Security is considered an important item. If an attacker compromises the controller, subsequently it loses the entire management over the network. Clearly, if we have multiple controllers, we can certainly minimize the issue, because they will team up to identify that another one is misbehaving and for that reason separate the attacker from the network. Brisk SDN develop an optimization framework and associate flow configuration algorithms to support fast-changing flflow demands in SDNs, by taking into account both the time to compute a new flow configuration at the controller and the time to deploy this configuration at the switches. The focus of this work is on networks with high flow dynamics, such as data centers, corporate networks, or IoT deployments. As a trade-off for faster configuration time, our framework generates slightly longer paths on average, compared to an algorithm which aims at satisfying flows through paths of minimum length. The main focus of this model is on SDN, network model, and its performance. The future SDN has a problematic future as it has issues to overcome. The first issue is the console/remote capability with today's security issues many will not want to expose their network to a potential hacker takeover. It is an Open Source Technology. Another issue is the current state of Network Management policies and practices with a single device or single path focus. When a Network Manager looks at SDN he only sees how it can help or hurt his network but SDN is much bigger and a lot of education still remains to be done to make SDN or similar technologies palatable.SDN is a Human Centric Technology where this technology is Device Centric which is and always will be a challenge to get managers to adopt especially when one person can completely change your network, storage, WAN, etc fabric. Advantage of the concept of a multi-controller design, but at the same time, and always consider that we have a single controller. In other words, can take the charge, and can distribute it among the multiple controllers; however, for the underlying layer, it is like there is just one controller that commands the whole network. Another idea was proposed before implementing multiple controllers, which is installing replicated controllers to remove the single point of failure. In a word, a logically centralized architecture stays near to the initial tendency of SDN, which is using a single controller, or a multi core controller to improve the performance. On the other hand, a logically distributed architecture goes away from the first tendency of SDN, by making several controllers have several responsibilities inside the network. In the SDN model, the splitting of the control and data forwarding functions is referred to as “disaggregation,” because these pieces can be sourced separately, rather than deployed as one integrated system. This model gives the applications more information about the state of the entire network from the controller, as opposed to traditional networks where the network is onlyapplication-aware.SDN model generally has three components or groups of functionality. First SDN applications

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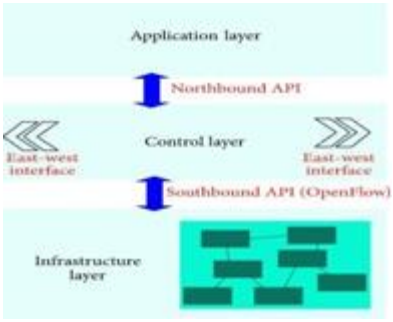
are programs that communicate behaviors and needed resources with the SDN controller via application programming interfaces (APIs). In addition, the applications can build an abstracted view of the network by collecting information from the controller for decision-making purposes. These applications could include networking management, analytic, or business applications used to run large data centers. For example, an analytic application might be built to recognize suspicious network activity for security purposes. The second one is The SDN controller is a logical entity that receives instructions or requirements from the SDN application layer and relays them to the networking components. The controller also extracts information about the network from the hardware devices and communicates back to the SDN applications with an abstract view of the network, including statistics and events about what is happening. And finally his SDN networking devices control the forwarding and data processing capabilities for the network. This includes the forwarding and processing of the data path. The SDN architecture APIs are often referred to as northbound and southbound interfaces, defining the communication between the applications, controllers, and networking systems. A northbound interface is defined as the connection between the controller and applications, whereas the southbound interface is the connection between the controller and the physical networking hardware. Because SDN is a virtualized architecture, these elements do not have to be physically located in the same place. Through this demonstrated model can find out the network communication delay. After finding queuing, computing, communication & deployment delay it helps to model networktime update algorithm.

A, FRAME MODEL

It demonstrates the SDN architecture with single-path routing (i.e., unsplittable flflows) in this work since single-path routing was the technique typically used in the SDN controllers (POX, Floodlight, and Open Day Light) and switches (Brocade ICX 6610)at the time.



Both the SDN control plane and data plane elements of a networking architecture were packaged in proprietary, integrated code distributed by one or more proprietary vendors. The Open Flow open-source standard, created in 2008, was recognized as the first SDN architecture that defined how the control and data plane elements would be separated and communicate with each other using the Open Flow protocol. The Open Network Foundation (ONF) is the body in charge of managing Open Flow standards. There are other standards and open- source organizations with SDN resources, so Open Flow is not the only protocol that makes up SDN. Model a network as an undirected graph, with a set of switches and the set of links. Each link is associated with capacity. Let H denote the current set of flows on this network. Each flow is associated with a source, a destination, and a demand specifying the flow rate. Depending on the construction of SDN rules, which can be specified by the network operator, a flow can be a single flow identified by a pair of IP addresses, as well as a batch of flows identified by an IP-prefix. The framework will compute an assignment of flows on a network topology, where the detailed definition of a flow can be set by the network operator. Model a network as an undirected graph with a set of switches and the set of links. Each link is associated with capacity. Each flow is associated with a source, a destination, and a demand specifying the flow rate. Depending on the construction of SDN rules, which can be specified by the network operator, an flflow can be a single flow identified by a pair of IP addresses, as well as a batch of flows identified by an IP-prefix. The framework will compute an assignment of flows on a network topology, where the detailed definition of a flow can be set by the network operator. In this framework, assume single-path routing

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(unsplittable flows) in this work, since single-path routing was the technique typically used in the SDN controllers and switches at the time.

B.UPDATE CONFIGURATION

After construct the topology find the delay between the flow arrival and the time the network is reconfigured to support it includes four components: Queuing delay: Amount of time or a certain number of flow demands to be processed in a batch. Avoid combining SI and CGS units, such as current in amperes and magnetic field in oversteps. This often leads to confusion because equations do not balance dimensionally. If you must use mixed units, clearly state the units for each quantity that you use in an equation. Computation delay: The controller calculates the time for new configuration. Deployment delay: Which is the time to deploy the rules at the switches? The queuing delay the time an SDN controller waits until a batch of flows is processed and the network configuration is updated. In highly dynamic environments such as data- centers or IoT deployments where the network is based on SDN, it is beneficial to set the queuing delay to a specified time threshold such as the lower bound of TCP retransmission time. The queuing delay can also be set as a threshold to the number of arriving packet-in messages in the SDN controller. Therefore it is recommended to use a combination of both approaches and trigger a new network configuration whenever the first threshold condition, waiting time or number of packet in messages, is satisfied. Then analyze the impact of flow configuration on the deployment time. In SDN, deploying a new configuration requires updating the corresponding rules in the flow tables of the switches. After the observation then update time of a flow table tends to grow with the number of updated rules, as updates on a given switch must be performed sequentially to ensure consistency. After insert/update a flow rule in the TCAM of SDN- enabled switches varies significantly depending on different hardware vendors and rule priorities.

The goal is to minimize the network update time by selecting a path for each flow in the set of flows which minimizes the maximum number of updated rules per switch, weighted by its per-rule update time. Then represent the path selection by a decision variable, which indicates if flow traverses undirected link, the traversals of links are directed. The decision variables must satisfy the flow conservation constraint. Then ensures that each flow is routed along a single path, and constraint ensures that the objective values are no smaller than the maximum update time of any switch. In the case of non-disruptive the solution to the Inundate Time problem can reroute existing flows, which Identify applicable sponsor/s here. If no sponsors, delete this text box (sponsors).

Can cause temporary disruption to applications relying on these flows. For disruption-sensitive applications, it is desirable that the configuration is calculated for the new flows only, leaving the existing flow undisrupted.

C.SHORTEST PATH DETERMINATION

The first step is a set of paths between each pair of nodes with minimum overlap, such that they will provide enough diversity to route the flflows to avoid excessive updates at any single switch. Then pre compute paths per switch pair, where the path is a design parameter that controls the trade-off between complexity and optimality. Specifically, given a parameter path and a switch source-destination pair, then want to and critical paths from source to a destination such that the maximum number of paths traversing the same switch is minimized. In the case of the Non-Disruptive Inundate Time problem is precisely to minimize the maximum number of flows in the flow set that traverse the same switch. The difference is that the link capacity constraint is no longer applies since the pre- computing paths instead of routing flows. Cycle avoidance constraints are also removed to reduce the complexity without affecting the optimal solution, and then it can remove cycles in a given solution without increasing the objective value. Thus, the problem of computing candidate paths referred to as the Candidate Path problem. The second step aims at selecting one path per flow from the candidate paths to minimize the network update time under link capacity constraints. Formulating this problem as optimization requires rewriting the optimization in terms of a new decision variable, which indicates whether path p is selected to carry flow. Ensure that the flow path is the shortest path and the conservation constrain is min UpdateTime.DN can be programmed with the help of python programming whereas SD- WAN is programmed by the vendor. SDN

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python page helps to enable network functions virtualization (NFV) within a closed system. SD-WAN, on the other hand, offers application routing that runs on an SD-WAN appliance or that can be virtualized. Typically in this SDN environment, customers can see all of their devices and TCP flows, which mean they can slice up the network from the data or management plane to support a variety of applications and configurations. The queuing delay the time an SDN controller waits until a batch of flows processed and the network configuration is updated. In highly dynamic environments such as data-centers or IoT deployments where the network is based on SDN, it is beneficial to set the queuing delay to a specified time threshold such as the lower bound of TCP retransmission time. Intent-based networking (IBN) has a variety of components but basically is about giving network administrators the ability to define what they want the network to do, and having an automated network management platform creates the desired state and enforce policies to ensure what the business wants happens. If a key tenet of SDN is abstracted control over a fleet of infrastructure, then the provisioning paradigm and dynamic control to regulate infrastructure state is necessarily a higher level. The policy is closer to declarative intent, moving away from the minutia of individual device details and imperative and reactive commands.IDC helps that intent-based networking represents an evolution of SDN to achieve even greater degrees of operational simplicity, automated intelligence, and closed-loop functionality. To reconfigure the network under changes in flow demand, consider the following algorithms: A randomized rounding algorithm that solves the optimization via linear programming (LP) relaxation followed by randomized rounding. The MILP formulation of the MinUpdateTime problem and its non- disruptive version allows us to leverage standard techniques to the approximation of MILPs. A minimax path algorithm that routes the flows sequentially on the feasible path that minimizes the maximum per-rule updates time among the traversed switches. A shortest path algorithm that routes the flows sequentially such that each flow uses the path with the smallest hop count with sufficient residual capacity to carry this flow.

EXPERIOR OF NETWORK

To evaluate dynamic flow demands, flow with a value of one arrive in our network every computation round, while previous flows depart the source and destination nodes of a flflow are selected based on random distribution. A number of flows the candidate paths for every node mean switch pair is used for the restricted algorithms. To emphasize the evaluation of the algorithms and models on network configuration time is less or not which is run with the help of python. After evaluating the metrics associate with each round of the simulation, evaluate the flow configuration algorithms in terms of how promptly they update the network and how well they satisfy the flow demands. The promptness is measured by both the time to compute the set of new rules and the time to deploy these rules at the switches. Based on these metrics, evaluate the total network configuration time total that is the total of configuration time and demand t time. In the simulations, the configuration is directly measured, but demand time is calculated based on the number of updated rules per switch. Then ignore the queuing delay and the southbound communication delay as they are negligible compared to Configuration delay and demand delay. Moreover, since the algorithms also differ in how much flow demand they can satisfy and measure the packet loss in the percentage of the overall demand. To compute the percentage of packet loss, calculate the ratio between the total demand of the dropped flow and the total amount of demand from all flows, in the number of packets. Here, the parameter of destination can be seen as the number of packets transferred by a flow. Then run the algorithms in two different modes. The first one is disruptive, where rules of existing flow can be updated in addition to accommodating new flow and the second one is non-disruptive, where only rules for newly arriving flows are added. In the presented evaluations we use the unrestricted shortest path algorithm as a comparison baseline for our proposed algorithms and models. In the Rocket fuel topology, the best performing algorithm in the non-disruptive case randomized random rounding; it shows the lowest total configuration time and has a negligible packet loss. The packet loss in the random rounding based algorithms is due to the rounding step which may cause congestion. Consider the

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disruptive case. Unlike the minimax algorithm, which is always non-disruptive, the shortest path and the randomized rounding algorithms show worse computation time in the disruptive case since more flows have to be processed in each round. The deployment time for the unrestricted random rounding algorithm is increasing in the disruptive case in both topologies. Both baseline algorithms do not perform well in scenarios with failing links. The unrestricted shortest path algorithm shows an increasing configuration time since fewer shortest paths become available with an increasing number of failing links. This causes congestion on a number of paths and results in increased deployment time. Once the network gets close to its saturation, the deployment time drops since only a small number of new flows can be accommodated and fewer disrupted flows recovered while the packet loss increases. The restricted shortest path algorithm shows a decreasing network configuration time caused by significant packet losses since only a restricted number of candidate paths are considered which does not make it a good approach for a scenario with flow disruption. After providing an overview of the average results of the evaluated algorithms. Considering the evaluated metrics total time and deployment time, our unrestricted minima algorithm shows the best performance in networked environments with failing links. As a trade-off for shorter network configuration time, the algorithms may compute longer paths compared to the shortest path baseline algorithm. This effect is smaller on structured topologies where path lengths tend to be uniform, such as in the case of the fat-tree, while it is more evident for the topologies of the Rocket fuel data-set. Expected, the shortest path based algorithms show the smallest path lengths, since their main objective is to minimize the number of hops between a source and a destination node. Our proposed minimax and randomized rounding algorithms follow a different objective and do not minimize the path length between network endpoints. As a trade-off, for faster network configuration time they produce longer paths. On a larger topology, this effect is slightly stronger on average due to the higher path diversity available between different nodes.

RECENT STUDIES

Destounis teal [1] proposed a paper "Minimum cost SDN routing with reconfiguration frequency constraints" model Software-defined network (SDN) controllers which include mechanisms to globally reconfigure the network to respond to a changing environment. As demands arrive or leave the system, the globally optimum flow configuration changes over time. Although the optimum configuration can be computed with standard iterative methods, convergence may be slower than system variations, and hence it may be preferable to interrupt the solver and restart. In this paper, we focus on the class of iterative solvers with an exponential decrease over time in the optimal gap. Assuming dynamic arrivals and departures of demands, the computed optimality gap at each iteration is described by an auto-regressive stochastic process.

S. Brandt et al [2] proposed a paper “On consistent migration of flows in SDNs" studied the problem of migrating flows consistently that without congestion or rate-limiting, with special focuses on software-defined networks. X.Wen et al. [3] proposed a paper "RuleTris: Minimizing rule update latency for TCAM based SDN switches". They highlighted the Rulers; the First SDN update optimization framework that minimizes rule update latency for TCAM- based switches. RuleTris employs the dependency graph (DAG) as the key abstraction to minimize the update latency. RuleTris efficiently obtains the DAGs with novel dependency preserving algorithms that incrementally build rule dependency along with the compilation process. Then, in the guidance of the DAG, RuleTris optimizes the rule updates in TCAM to avoid unnecessary entry moves, which are the main cause of TCAM update inefficiency. Here prove that RuleTris generates TCAM updates with the minimum number of TCAM entry moves. In addition, S. Vissicchio[5], L. Cittadini[6], S. Vissicchio[7], and L. Cittadini [8] studied about Safe, efficient, and robust sdn updates by combining rule replacements and addition. It implies that disruption-free updates are a key primitive to effectively operate SDN networks and maximize the benefits of their programmability. In this needs to study how to implement this primitive safely (with respect to forwarding correctness and policies), efficiently (in terms of consumed network resources) and robustly to unpredictable factors, such as delayed message delivery and processing. First, analyze the fundamental limitations of prior proposals, which either: progressively

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replace initial flow rules with new ones or instruct switches to maintain both initial and final rules. Second, It shows that safe, efficient, and robust updates can be achieved by leveraging a more general approach. Indeed unveil a dualism between rule replacements and additions that opens new degrees of freedom for supporting SDN updates. Third, demonstrate how to build upon this dualism. For that propose FLIP, an algorithm that computes operational sequences combining the efficiency of rule replacements with the applicability of rule additions. FLIP identifies constraints on rule replacements and additions that independently prevent safety violations from occurring during the update. Then, it explores the solution space by swapping constraints that prevent the same safety violations, until it reaches a satisfiable set of constraints. Fourth, perform extensive simulations, showing that FLIP can significantly outperform prior work. In the average case, it guarantees a much higher success rate than algorithms only based on rule replacements, and massively reduces the memory overhead needed by techniques solely using rule additions.

CONCLUSION

In this paper the problem of minimizing the network configuration time in an SDN in response to changing demands, by computing a flow configuration that minimizes the worst- case update time across switches. That empirically show that our heuristics can reduce the update time of a shortest-path baseline algorithm on average packet loss. Further, shows that the proposed algorithms are able to reestablish disrupted flflows in scenarios with failed links are faster on average compared to shortest-path based algorithms. The amount of automation can leverage out of a Networking process that can help in various ways. It's the best way to invest speed in the overall networking operations. Offer a centralized view of an organization's entire network, making it easier to streamline enterprise management and provisioning. As VLANs become a more prominent part of physical LANs, the number of links and dependencies can easily create confusion. SDNs can speed service delivery and provide more

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A REVIEW PAPER ON ANTI SLIDE PILES FOR SLOPE STABILIZATION

Renjini R[1], Ranjima K S[2], Naeema Amina Najeeb[3]
[1,2,3] PG Student
[1,2,3] Department of Civil Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala, India.

ABSTRACT: ***The slopes of weak soil during landslides are very unstable and can cause serious damage of life and property if not analyzed and reinforced properly. There are various methods of improving the slope stability; one such method is installing anti-slide piles. Anti-slide piles have been used to improve stability of slope and to analyze it we check several factors like pile spacing, length and pile position with respect to FOS of the slope. In the review of slope stabilization several analysis found such as increasing the pile parameter, changing the pile position improving the factor of safety etc. This reviewed approach on anti-slide piles for slope stabilization provides potential and sustainable solution.***

Key words: Anti slide piles, Slope stabilization, Pile position, Factor of safety.

INTRODUCTION

Anti-slide piles are utilized as a treatment of very unstable soil-slopes, and are proved to be an efficient reinforcement method. It considerably increases the factor of safety of the slope. The piles are considered as passive piles within the upper unstable soil layer but active piles within the lower stable soil layer. For slopes with great depth between ground surface and stiff stratum, the answer is impractical to embed piles into bedrock or a stable layer (infinite pile length assumption). Thus, the embedded length of piles is a problem and attracts great attention. Griffiths et al. studied the influence of pile reinforcement on stability of slopes by several methods, and presented the influences of pile length on stability and factor of safety of slope. But the analysis was administered under two-dimensional plane strain, which couldn't reflect the particular pile-slope interaction. Qin and Guo conducted some model tests on vertically loaded single piles in sand Subjected to either a consistent or a triangular profile of soil movement, and studied the effect of depth of soil movement on pile behavior. Yoon et al. introduced an easy chart for laterally loaded short piles in cohesion less soils to account for the effect of "finite slope", and expressed the specified pile length during a slope as a dimensionless ratio. Anti-slide piles have been used in the slope model. Then the effect of parameters like pile spacing, pile position and pile spacing on the factor of safety of the slope have been analyzed to determine optimum pile parameters.

Anti Slide Piles for Slope Stabilization

Sifeng Zhang, (2020) examined that the pile-soil interaction mechanism and the use of antislide piles for slope reinforcement based on numerical modeling and the force and displacement principles of slopes and antislide piles are analysed.The influences of various factors are investigated in this paper such as post pile filling parameters, pile embedding methods, and pile cross-sectional shapes. Numerical modeling is used to determine the optimal layouts of antislide piles for push and traction landslides. The results show that the cohesive force of the fill has a greater influence on the piles, the slope angle. Fully buried antislide piles provide a better ant sliding effect than semiburiedones. The best controlling effect is obtained with fully buried piles, when the ratio of the length of the pile's free section to the height of the sliding body is approximately 4/5. End-bearing arches can be utilized as the primary control structures, with friction arches used for secondary control to improve the soil arching effect and thereby enhancing the stability of the piles and slope. To control landslides of various thrust forms, antislide piles should be set in the active section, the core sliding section, or both, as required. This provides guidance for improving the

design of antislide piles. Guangfu Chen, (2020) examined the pile-spacing which is decided by the load capacity of single piles or consistent with engineering empirical experience. Many engineering practices and laboratory experiments shows that the soil arching effect existing in landslide can controlled with anti-slide piles. He aimed to calculate pile-spacing in terms of the soil arching effect. He investigated the pile-soil interaction mechanism. According to Mohr–Coulomb strength theory and limit equilibrium theories, he derived a replacement pile-spacing calculation equation. He verified the derived pile-spacing calculation equation with real projects. The equation is often utilized in anti-slide pile preliminary design. Rashid Shams, (2020)examined that the steadiness of a slope are often improved with anti-slide piles, and therefore the factor of safety increases with increasing pile length and tends to be a continuing when the pile length exceeds the critical length. He found that the critical length increases with decreasing pile spacing. The smaller pile spacing tends to extend the stiffness of reinforced slopes. Optimum pile length would be around 10-15 m and optimum spacing for single row of pile for this case are going to be around 0.65-0.55 m. The pile position of anti-slide pile also has some influence on the steadiness of soil slope. With the rise of distance from anti slide pile to toe of slope, factor of safety of soil slope increases first then decreases. The most important FOS is obtained when pile is about 7 m faraway from the toe. Hao Wang, (2020)examined the anti slide piles set within the Zhangjiawan landslide area, where the general features of the bedrock below the slip surface include upper weak and lower hard strata. Based on a site investigation, the horizontal displacement of the antislide pile head is 14.8 cm, which isn't conducive to the steadiness of the landslide. In this study, a displacement calculation method for the pile under various loads is proposed for a colluvial landslide controlling and also several factors affecting the deformation and internal forces of the pile were also studied. Yi Tang, (2017) examined the use of anti-slide piles together of the foremost important landslide remediation methods, and widely utilized in practical engineering. The study includes Anti-slide pile design elements such as pile plane position and spacing, the anchorage depth, and pile cross-sectional shape and size. With the displacement of an anti-slide pile head because the evaluation index of the anti-sliding effect of anti slide pile, ANSYS was wont to establish models for numerical simulation to provide analysis of the pile spacing and to work out the anchoring depth and cross- sectional dimensions of the impact of pile top displacement. They studied the control variable method, the influence trends and the degree of influence of three factors on the displacement of pile top. Jinqui Pan, (2017) examined regarding numerical calculation convergence and plastic zone through the slope as the criterion of slope instability, strength reduction method and for calculating principle, the stability of soil slope was analyzed by using finite element software ABAQUS, and on the idea of study, the simplest position and pile distance of anti-slide pile of reinforced soil slope were studied. The numerical results showed that when the distance increase, the distance between anti-slide pile and toe position, safety coefficient firstly increased and then decreased, when the ratio between the horizontal distance of anti-slide to slope toe and horizontal distance of slope is around 0.6, which is that the largest safety factor; The pile spacing had certain influence on the soil slope factor of safety, with the various pile spacing, the security factor was different. With the rise of the pile spacing, the security factor decreased gradually. Chunmei Zou, (2014) examined the design of anti-slide piles as a soil stabilization in Wanzhou city located within the Three Gorges area where several landslides had occurred. Due to the development of the Three Gorges Reservoir the hydro-geological conditions during this area have deteriorated significantly, resulting in larger instability problems. One of the methods for the stabilization of huge landslides is that the design of anti-sliding piles. This paper focuses on extensive slope stability analysis and modeling of the mechanical behavior of the landslide masses, and the parameters required for designing the number, size and dimensions of reinforced concrete stabilization piles. And also focused on

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determining the rock parameters, anchor depth, and therefore the pile and soil interaction coefficient. The study aims to supply guidelines for anti-slide pile stabilization works for landslides within the Wanzhou area. The research work contains a number of aspects. First a study is administered on the distribution of pressures expected on the piles, using two different methods that take under consideration the expected pore water pressure and seismic acceleration. Nian Qin Wang, (2014) examined that the landslide disaster control and high slope strengthening engineering, anti-slide pile is one of trusted engineering measures, but cognition in aspect of forced state on the anti-slide pile, the pile-soil mechanism etc, which should be strengthened. In this study monitoring objects with three cantilever anti-slide pile entities within the loess high slope somewhere, burying monitoring instruments like earth pressure cells and steel bar meter, for as long as 18 months of monitoring. Through analysis of monitoring results, can draw the following conclusion that the soil pressure distribution form before the anti-slide piles is parabola-shape as a whole, whatever above the slip surface or under the slip surface the soil pressure distribution from behind the anti-slide piles is almost triangle as a whole; The anti-slide piles construction are completed, pile-soil interaction force and reinforced by stress reaches stability in about 16 months; A maximum soil pressure before the anti-slide piles on the ground, the soil pressure behind the anti-slide piles near the potential sliding surface. Xin Xing Wu, (2013) examined that the anti-slide pile was widely used in the slope-sliding control, based on the traditional Anti-slide pile, a kind of high efficiency and good effect new slope anti-slide pile-Buttress Anti-slide Pile- was put forward, which changed the cantilever stress condition and the mechanism of depending entirely on lateral sub grade reaction to balance the landslide thrust of the traditional anti-slide pile, and the theoretical calculation formula is deduced.

Chang Dong Li, (2012) examined that long-distance gas transmission pipelines were designed to cross the western mountain area, where safety depends on the steadiness of related landslides. Anti-slide piles are among the most effective reinforcement measures in the field of landslide improvement. This paper presents a load-sharing pattern study of anti-slide piles reinforcement against landslide with pipeline crossing. Based on the case study of typical landslide and natural gas transmission pipeline, the mechanical model of landslide and pipeline was performed, from which the mechanical analysis on deformation of the pipeline is carried out. By using the numerical modeling method, the load-sharing pattern of anti-slide piles, sliding mass and pipeline was analyzed in detailed. The result shows that there's clearly destructive stress concentration occurring at the rear a part of the pipeline, and therefore the setting of the anti-slide piles can drastically reduce the load-sharing ratio of the pipeline. That is the rationale why the anti-slide piles can provide protection of the pipeline within the aspects of stress and deformation. The proper setting of anti-slide piles can improve the state of stress on the pipelines, which is that the crucial explanation for the reinforcement mechanism of anti-slide piles.

DISCUSSION

It was shown that the stability of a slope can be improved with anti-slide piles, and, the factor of safety increases with increasing pile length and tends to be a constant when the pile length exceeds the critical length. The setting of the anti-slide piles can drastically reduce the load-sharing ratio of the pipeline. That is the rationale why the anti-slide piles can provide protection of the pipeline within the aspects of stress and deformation. The proper setting of anti-slide piles can improve the state of stress on the pipelines, which is that the crucial explanation for the reinforcement mechanism of anti-slide piles. The pile position of anti-slide pile also has some influence on the steadiness of soil slope. With the increase of distance from anti slide pile to toe of slope, safety factor of soil slope increase first and then decreases. It was evidenced that researchers like Sifeng Zhang, 2020, Guangfu Chen, 2020, Rashid Shams, 2020, Hao Wang, 2020, Yi Tang, 2017, Jinqui Pan, 2017, Chunmei Zou, 2014, Nian Qin Wang, 2014, Xin Xing Wu, 2013, Chang Dong Li, 2012 explained all features regarding anti slide piles for slope stabilization. The analysis of the slope model for the FOS

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was carried out on GE05 2020 soil stability program. This program is employed to perform slope stability analysis (embankments, earth cuts, anchored retaining structures, MSE walls, etc.).

CONCLUSION

The various methods that are used to analyze the slope stability using anti slide piles have been reviewed. The effect of landslide is reduced to a large extent. Anti-slide piles are utilized within the treatment of very unstable soil-slopes, and are proved to be an efficient reinforcement method. It considerably increases the factor of safety of the slope. The piles are considered as passive piles within the upper unstable soil layer but active piles within the lower stable soil layer. Thus, the embedded length of piles is a problem and attracts great attention.

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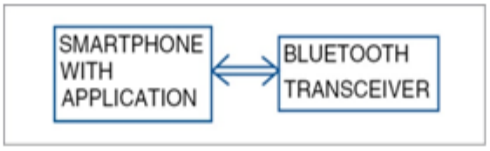
VOICE COMMAND INTEGRATED AUTOMOBILE

Gayathri Velly Vijay[1], Zenin Adnan[2], Nazal Shameem[3], Aleesha Mohamed Ali[4], Jensy Andrews[5]
[1,2,4,5] PG Scholar,
[1,2,3,4,5] Department of Computer Science and Engineering
[1,2,3,4,5] IES College of Engineering, Chittilappilly, Thrissur, Kerala

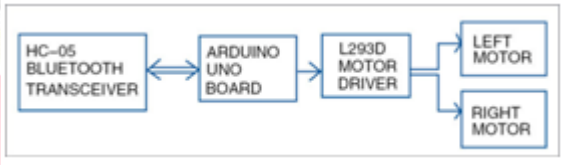
Abstract: ***We propose an idea where we create a miniature electric car for which can be controlled using voice commands. This is possible by different Arduino programming techniques. The entertainment of driving a toy car increases with this concept and parents have better control over the child's vehicle when it reaches out of arms distance. Autonomous cars are the future smart cars anticipated to be driver less, efficient and crash avoiding ideal urban car of the future. To reach this goal automakers have started working in this area to realized the potential and solve the challenges currently in this area to reach the expected outcome. In this regard the first challenge would be to customize and imbibe existing technology in conventional vehicle to translate them toa near expected autonomous car. We believe bringing an intelligent integration of voice command modules to automobile is the first step to achieving this goal.***

Introduction

This project describes the implementation of a voice-controlled robotic car using Arduino. In this project, the user gives specific voice commands to the robot through an Android appinstalled on the Smartphone. At the receiving side, a Bluetooth transceiver module receives the Commands and forwards them to the Arduino on the robotic car. Arduino controls the movements of the robot according to received commands. The robot moves forwards, backwards, left and right, and stops according to the voice commands forward, backward, left, right and stop, respectively.



Transmitter side



Receiver side

The system consists of a transmitter (Android smartphone) and a receiver (robot). Fig B locks diagrams of the transmitter and receiver sides are shown in Figures respectively.

Related works

1. An evaluation of two approaches for voice-controlled Arduino-based autonomous systems is performed. The first approach uses an embedded voice recognition (VR) system that is interfaced with an Arduino-based hardware platform. In the second approach a speech recognition programming module is integrated into the development environment of the Arduino-based system. The main objective is to provide a mechanism for controlling an autonomous quad copter using natural language voice commands. A supplemental goal of this research is to increase the knowledge base and skill set of undergraduate engineering students by developing a curricular component for inclusion in laboratory courses, such as a speech processing course or a course in mechatronics, or even in research experiences of undergraduates. The designs for each voice-recognition approach have been identified. The next phase of the work is to implement each design and ensure proper performance. The main design tasks in this work have yet to be implemented. The next phase will involve implementing both designs and observing the results. It is anticipated that design two will allow more flexibility in the design and development of a large functionality to be platform independent, speaker-independent, but not having much

flexibility for algorithm design modifications. Vocabulary, speaker- independent voice-recognition engine.

2. Cars are vehicle that people use every day, and technology development on the car has been growing so rapidly. In this study, the researchers will create a new innovation on the car by using a smart watch which is existing features on cars can be in controlled with smart watch through voice commands. Implementation will be done and will be finished this year, and the researchers will add some features on the smart watch and it will be controlled through voice commands. This system must be connected to the Arduino smart watch through Bluetooth, and after it connected to the Arduino, it will validate the command or signal sent by the smart watch. The features that will be controlled by the smart watch such as; turn the car engine on, open and lock the car's door, and raise or lower the car window. This research is expected to be a reference to develop innovation in terms of technology in the future. The development of the car is very fast starting from the year 1900 to 1920-60s due to the manufacture and production of the car in large numbers to get the attention of the world. These developments include electronic systems such as the starter system and braking system on all four tires of the car. Along with the advancement of technology up to now, the world automotive industry continue to make innovations to develop the cars' performance such as; the attributes in the car, the increased volume of the engine, the starter, the fuel system, and the braking system. Even now some factory has developed a future car that can run without the driver, it is like flying car, and it use electric power. It's all created for the development of technology information that is constantly evolving in this modern era.

3. This paper presents an Internet of Things (IoT) system which is controlled by human voice and natural language, including appliance and indoor environment sensor. The appliances will be bundled with a socket controlled by relay and a MediaTekLinkIt 7697, which is marketed Arduino compatible development board. The environment sensor was DHT11, a marketed indoor environment sensor, which also bundled with a MediaTekLinkIt 7697. The protocol to communicate with both MediaTekLinkIt 7697 is Message Queuing Telemetry Transport (MQTT). The gateway for this IoT application is a QBoat Sunny; it is home IoT gateway of Taiwan QNAP Corp. which has built-in Linux and numerous functions. Based on these functions, the IoT system can access voice recognition and natural language parsing functions of Google to accomplish the jobs. There are many occasions in life that are perfect for voice notifications or reminders, such as many people who do not carry a smart phone with them at home, and for some bedridden people, it's easier to communicate what they're going to do by voice. Our research decided to create an IoT system is similar to "Axela", which is able to interactive with users by natural speech. This IoT system will record user's voice into a media file in memory, after set up duration, it uploads the media file to Google's Speech to Text (STT) service to get plain text .After the IoT system get the returned plain text from Google, will call the on line natural language understanding engine "Dialog Flow", which is also owned by Google now . The two-pass procedure produce instructions as defined in "DialogFlow" at last, our IoT system recognize the returned instructions to perform action like turn on and off the light, or answer the temperature and humidity to user by synthesis voice generated by "speak" this open-source package. Reducing costs of healthcare and improving diagnostic speed and accuracy. This research focuses to link the level of acceptance wearable technology of physicians with that of the users. From the findings, it is evident that 60% of medical professionals agree to use such devices on the basis of PEU. Considering PEU, 51.41 percent of non-medical personnel agree to use it. This contrast is due to increased level of medical people's exposure and knowledge of these devices. In addition, 72.73 percent and 69.72 percent of medical and non-medical people agree to the adoption of these devices. The study acts as a forum for raising awareness of such wearable devices. The implemented IoT system provides an overall p patient supervision service that includes two key functionalities:

a) Patient location and tracking: accurate patient location knowledge is a useful asset as it enables timely reaction in the event that urgent aid or assistance is required.

b) Patient health status monitoring: The current condition of critical/normal patients should be continually accessible to the doctor or medical staff. Depending on the type of pathology, it

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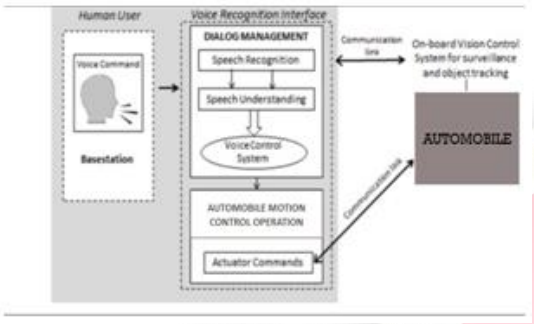
may be necessary to collect different pieces of data about the patient's health status (movement, heartbeat, pulse rate, breath, temperature, etc.), possibly automatically detecting abnormal changes in these parameters.

Proposed System



Tech giants have been developing autonomous vehicles for quite a long time now , but the idea has not been legalized yet due to the safety concern of leaving the entire job to a machine .What we propose is to provide voice recognition technology to drive an automobile so that the vehicle is controlled by an human even when the person in not necessarily driving the vehicle.

There are two designs under consideration

-Interfacing the automobile system with an embedded voice recognition hardware module.

- Interfacing the system with a software module for speech recognition.

-We aim to achieve this by implementing Arduino based programming.

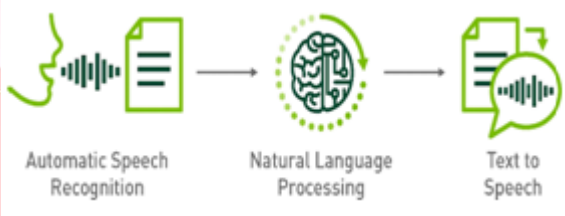
STEPS INVOLVED IN THIS PROCESS

-User gives input through a smart phone application

-The speech is recognized in the voice recognition interface and it is compared with the commands in its database.

-The automobile motion control unit receives the data and determines mobility of the system.

NLP module is used for the language processing. NLP refers to the evolving set of computer and AI-based technologies that allow computers to learn, understand, and produce content in human languages. The technology works closely with speech/voice recognition and text recognition engines. While text/character recognition and speech/voice recognition allows computers to Input the information, NLP allows making sense of this information. Though scientists and researchers have done a lot of theoretical work on NLP in the past, we have only recently started seeing its real-world use cases. NLP-based systems are augmenting both human-human communication (e.g., with language translation) as well as human-machine communication (e.g., virtual assistants).



Hardware: The hardware of our proposed system is sophisticated integration of various smart components .Manipulating the functionality of wifi sender and receiver modules to transmit commands can be performed in this case. The wifi modules carry command data from the user to the NLP module and will give feedback of the action performed .The NLP module used to recognize and process speech commands is housed inside an Arduino board which will be used inside the prototype. The processed commands are put into actual use by implementing them on electric motors and corresponding actuators. Software: Slave default baud rate: 9600; data bits: 8; stop bit: 1 ; parity: no parity Auto-connect to the last device on power as default Permits pairing device to connect as default Auto-pairing pin: 1 234 as default Pin description. HC-05 Bluetooth module has six pins, as detailed below. Enable. When enable is pulled low, the module is disabled. This means the module will not turn on and will fail to communicate. When enable is left open or connected to 3.3V, the module is enabled, that is, it will remain on and communication will also take place. When the module is not connected to or paired with any other Bluetooth device, the signal goes low. At this low state, the on board LED flashes

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continuously, which denotes that the module is not paired with another device. When this module is connected to or paired with another Bluetooth device, the signal goes high. At this high state, the on board LED blinks with a constant delay of, say, two seconds. This indicates that the module is paired. L293D motor driver. This is a dual H -bridge high-current motor driver IC. It is used here because digital pins of Arduino cannot source enough current to drive the motors of the robotic car. H-bridges are also useful in controlling the direction of rotation of a motor. Enable pins 1 and 9 of the IC, being active high, are connected to 5 V. F our output pins of L293D IC are connected to motors M 1 and M 2 on the receiver side.

Conclusion

➔ Users can summon cars from large parking lots using voice commands.

➔Parking into tight spaces becomes easier.

➔Using this technology in toy cars for kids gives parents complete control even if they are not physically close enough.

➔ Voice commands can be used to perform convenient operations like unlocking the car, turning on air conditioning, control infotainment systems etc.

➔ No matter where in-car speech recognition goes next, consumers can rest assured that the focus is on equal parts safety and convenience.

➔ Plus, luring customers to a product with the latest bells and whistles isn't all bad for the tech companies either.

➔It's important for drivers to remember that voice-activated does not equate to "distraction free". While companies persuade us with promises of increased safety, it's up to you to keep your eyes on the road.

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Wallace Tree based Multiplier using Modified Full Adder and Brent Kung Adder

Linson K Vincent[1], Sindhu T V[2] and Ajeesh S[3]
[1,2,3] PG Scholar, Department of Electronics and Communication Engineering, IESCollege of Engineerin. Chittilappilly, Thrissur, Kerala

Abstract – The major role of electronics device is to provide low power dissipation and compact area with high speed performance. Attaining very fast digital devices with reduced power utilization is an important interest to the VLSI circuit designers and manufacturers. Essential part of the digital system likes Arithmetic and Logic Units, Digital Signal Processors, etc... Are multipliers. Usually, they prompt the performance like power, delay and area utilization of the system. Hence there is an increasing demand for the improvement of performance of the multiplier. For the most part computation functions are carried out using the multiplier, where it is found to be more power consuming component in the electronic circuits. Eventually, the operation of multiplication has been carried out by the process of shift and add method. Due to the enhancement among various adders, which paved the way for the increase in execution rate of the multipliers. Parallel multiplication algorithms often use combinational circuits and don't contain feedback structures. The circuit is developed utilizing VHDL and functions were validated based on the simulations obtained utilizing Xilinx. In this work, the improvement in WTM using the BKA and the Modified Full Adder concepts is done. 16x16 bit WTM is designed using the BKA and reduced delay and area of the system. The Simulations are done Utilizing Xilinx ISE 14.7 software.

Keywords: Wallace Tree Multiplier (WTM), Brent Kung Adder (BKA), Kogge Stone Adder (KSA), Partial Product (PP)

INTRODUCTION

Multipliers are one the most important component of many systems. In high speed Digital Signal Processing (DSP) and image processing multiplier play a vital role. In image Processing Fast Fourier Transform (FFT) is one of the most important transform often used. A computational process of Fast Fourier Transform requires large number of multiplication and addition operation. The execution of these algorithms requires dedicated MAC and Arithmetic and Logic Unit (ALU) architectures. Multipliers and adders are the key element of these arithmetic units as they lie in the critical path. Multiplication consists of three steps: generation of partial products (PPG), reduction of partial products (PPR), and finally Carry-Propagate Addition (CPA). There has been extensive work on low-power multipliers at technology, physical, circuit and logic levels. A system's performance is generally determined by the performance of the multiplier because the multiplier is generally the slowest element in the system. Furthermore, it is generally the most area consuming. Hence, optimizing the speed and area of the multiplier is a major design issue. However, area and speed are usually conflicting constraints so that improving speed results mostly in larger areas. As a result, a whole spectrum of multipliers with different area- speed constraints has been designed with fully parallel. Wallace tree styles use a log-depth tree network for reduction. Faster, but irregular, they trade ease of layout for speed. Wallace tree styles are generally avoided for low power applications, since excess of wiring is likely to consume extra power. While subsequently faster than Carry-save structure for large bit multipliers, the Wallace tree multiplier has the disadvantage of being very irregular, which complicates the task of coming with an efficient layout. The Wallace tree multiplier is a high speed multiplier. The summing of the partial product bits in parallel using a tree of carry-save adders became generally known as the 'Wallace Tree'. Numbers can be represented in digital circuits in various ways. Hence, developing efficient adder architecture is crucial to improving

the efficiency of the design. Generally, ripple carry adder is used for binary addition. After the design of ripple carry adder several techniques are used for the computation of

Parallel adders. Carry look ahead adders are based on parallel prefix computation which gives better performance than ripple carry adder. After many years of research, focus is on improving the delay performance of the adder. As such, extensive research continues to be focused on improving the delay performance of the adder. Next, Brent and Kung (BK) designed parallel prefix-computation graph in an area-optimal way and the Kogge Stone (KS) architecture is optimized for timing. WTM is considered as one of the efficient fast multipliers. Wallace multiplier comprises of three stages namely:

1. PPG
2. PPR
3. Addition at last stage

And in the Partial Product Reduction it consists a 15-4 compressor which is made up of modified full adders and 5-3 compressor and KSA. In the last stage addition where the delay shows a key role, thereby to reduce delay parameter KSA has been used. KSA is one of the fast-parallel adders used in computation for the reduction in delay from the expected output.

RELATED WORKS

Deepak Raj *et al* [2] designed and Implemented different types of efficient parallel prefix adders. In this work they investigation of four types of PPA's (Kogge Stone Adder (KSA), Spanning Tree Adder (STA), Brent Kung Adder (BKA) and Sparse Kogge Stone Adder (SKA)) is done. Additionally, Ripple Carry Adder (RCA), Carry Look Ahead Adder (CLA) and Carry Skip Adder (CSA) are also investigated. The area, delay and power consumed by all types of PPA's are analyzed. The area of the adder design is given in terms of Look up Tables (LUT's) and Input Output bounds (IOB's). The adder designs are implemented and delay, power and area of all the adders are investigated. T. Arunachalam*et al* [3] Analyzed different types of high speed multipliers. Here the analysis of various multipliers such as Wallace tree multiplier, Dadda tree multiplier and proposed Dadda tree multiplier using sklansky tree adder is investigated. The speed of the circuit is decided by the latency of the circuit. The latency count is reduced from 27 to 18 that are 33.3% and with respect to the Dada multiplier is 21% increase in speed compared to the existing multiplier. Priyanka Mishra *et al* [4] provide a study on Wallace tree multiplier. And they concluded that Wallace Multiplier is superior in all respect like speed, delay, area, complexity, power consumption. Dhaval R Gandhi *et al* [5] after comparative analysis of various full adders, GDI XNOR full adder, transmission gate full adder and Zhuang full adders are selected for Wallace tree multiplier. After designing Wallace tree multiplier by using three different adder circuits GXFA is a best suited and where speed is the only criteria, ZFA is best suited as an adder circuit. Whereas TGA gives good result in all the criteria. Results can be compared with traditional method and observed that 42% transistors are saved, results in reduction of area, and reduction in power at improved speed of operation. Kokila Bharti Jaiswal *et al*[6] implemented a low power Wallace Tree Multiplier using modified full adder. The designs are synthesized in Synopsys Design Compiler using SAED90nm CMOS technology. This work mainly deals with the replacement of full adders with modified full adder in the reduction phase of the Wallace tree multiplier. Sandeep Kakde*et al* [7] designed 4x4 Wallace multiplier using Area Efficient CMOS full adder. CMOS Full Adder is the main building block in any Multiplier Design. The proposed multiplier has a much less area and hence less power delay product and number of half adder used are reduced to the great extent. The layout of the 4x4 Wallace multiplier is drawn with 250nm CMOS Technology and the layout is checked as per Design Rule Check File. R. Bala Sai Kesava*et al* [8] designed a fast multiplier with less power consumption are leading with their performance. Wallace tree multiplier with Carry Select Adder (CSLA) and Binary Excess-1 Counter (BEC) which reduces the area at gate level and also reduces power consumption. Area and power calculations for the Wallace tree multiplier using CSLA with BEC are giving good results compared to regular Wallace tree multiplier. Shahebaj Khan *et al* [9] implemented a reduced complexity Wallace Multiplier using energy efficient CMOS full adder. They proposed the use of Energy Efficient CMOS full adder in reduced

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complexity Wallace Multiplier at the place of Full adder of standard Wallace Multiplier in order to reduce area, power and improvement in speed. The Reduced complexity reduction method smartly reduces the number of half adders with 70-80% reduction in an area of half adders than standard Wallace multipliers'. Surekaet *al* [10] implemented an efficient high speed Wallace Tree Multiplier. The proposed architecture aims to reduce the overall latency, which leads to increased speed and reduced power consumption. In their architecture, they make use of compressors in place of full adders, and the final carry propagate stage is replaced by a proposed carry select adder.

WALLACE TREE MULTIPLIER

Multiplier is the substantive part of the electronic device and decides the overall performance of the system [2]. When designing a multiplier, huge amount of power and delay are generated. To minimize these disadvantages, adders and compressor are used. Hence reducing delay in multiplier has been a main aim to enhance the performance of the digital systems like DSP processors. Hence many attempts are done on multipliers to make it faster. It is an effective hardware realization of digital system that is nothing but a Wallace tree which multiplies two numbers and minimizes the number of partial products. In vector processors, several multiplications are performed to obtain data or loop level parallelism. High processing speed and low power consumption are the major advantages of this multiplier. The Wallace tree multiplier is considerably faster than a simple array multiplier because its height is logarithmic in word size. However, in addition to the large number of adders required, the Wallace tree's arrangement is much less regular and more complicated. The Wallace tree multiplier is a high speed multiplier [3]. As a result, these are often avoided by designers, because the design complexity is a concern to them. The summing of the partial product bits in parallel using a tree of carry-save adders became generally known as the 'Wallace Tree Multiplier'. The three main steps are used to multiply two numbers:

1. Formation of partial products.
2. Reduction of the partial products matrix into a two row matrix by means of a carry save adder.
3. Addition of remaining two rows using a faster Carry Look Ahead Adder (CLA).

A. Conventional Wallace Tree Multiplier

In the conventional Wallace Tree multiplier, the partial products are formed by N^2 AND gates in the same manner as that of Dadda multiplier. The formed partial products are collected to group of three or two. Full adders are applied to columns containing three bits and half adders to column containing two bits. Carry save adders are used for the addition of partial products. Since the Wallace multiplier performs the reduction as soon as possible the number of half adders and full adders required is high [3]. The Basic conventional Wallace multiplier for N=8 is shown in Fig 3.1.

Fig.1. Conventional Wallace Tree Multiplier

Proposed Wallace Tree Multiplier

A WTM is an effective hardware which makes use of electronic circuit that products numbers. In this design, a Wallace tree multiplier since it has the advantages of superior processing speed and minimal power utilization. There are three stages for a multiplication process usually occurs:

- Generation of Intermediate partial products
- Reduction of them
- Addition at the end

Fig 2 and 3 describes the structure and schematic view of 16-bit multiplier using with the help of 15-4 compressor. Here in this design each dot denotes partial product. From 13th column onwards, 15-4 compressors are used in this multiplier architecture. Column number 13 consist of 13 partial products, in order to get 15 partial products 2 zeros are added. Similarly, in 14th column, one zero is added. Approximate compressors

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are used in $13^{th}, 14^{th}$and 15^{th}column of multipliers. The partial product reduction phase consists of various half adders, modified approximate full adders and 5:3 compressors [17]. When the numbers of bits in the column are 2 and 3 half adders

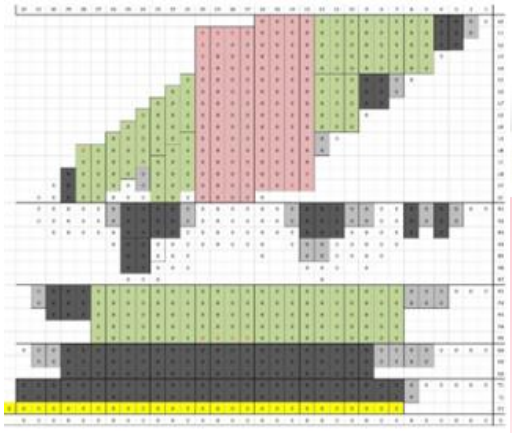

Fig.2. Configuration of 16x16 WTM utilizing 15-4 compressor

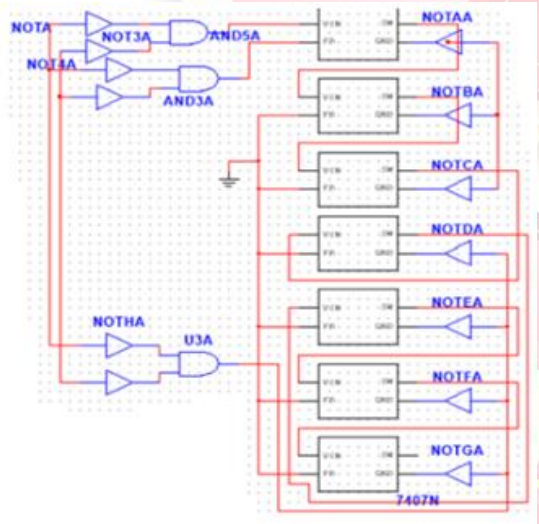

Fig.3. Schematic View of 16x16 Bit Wallace Tree Multiplier

And full adders are used in each column. In case of a single bit, it is moved further to the subsequent level of that particular column without any need for further processing. Until only two rows will remain, this reduction process is repeated. Finally, summation of the last two rows is achieved using 4-bit Kogge Stone Adder and also by Brent Kung Adder.

15-4 COMPRESSOR

In this part it is considered the design of 15-4 compressor by using with approximate 5-3 compressors [18]. This compressor compresses 15 inputs (C0-C14) into 4 outputs (B0-B3). The 15-4 compressor consists of three phases. The compressor has 5 modified approximate full adders at the initial phase, 2 5-3 compressors in the secondary phase and the last phase has a KSA. Sum and Carry is generated out of the given inputs. One of the two 5-3 compressors obtains the sum bits of all the modified approximate full adders. Likewise, the other compressor obtains the carry bits of all the modified approximate full adders. A compressor adder delivers lowered delay on standard adders applying all the half adders with modified approximate full adders [18]. Yields of intermediate compressors provided as input for the KSA. With the use of KSA at last stage the output is obtained. Compressors are used in the reduction of quantity of gates also the amount delay when compared to the other adders. The Approximate compressor of 15-4 involves three segments. 1^{st}segment consists of five modified approximate 3 input full adders, whereas 2^{nd}segment consists of two 5-3 compressors and 3^{rd}segment the 4-bit KSA.

Modified Approximate Full Adder

Modified full adders have been used in the initial stages of the entire architecture [2]. There are exactly 5 number of modified approximate full adders in the design. This is used in the area of conventional full adders to reduce the gate counts using approximation concept. The modified approximate full adder uses only one OR gate, one EX-OR gate and one AND gate in total to obtain the desired function of a full adder thereby reducing the number of gate counts and other parameters like power, area. These modified approximate full adders after its functioning produces 5 equivalent sum outputs and 5 equivalents carry outputs.

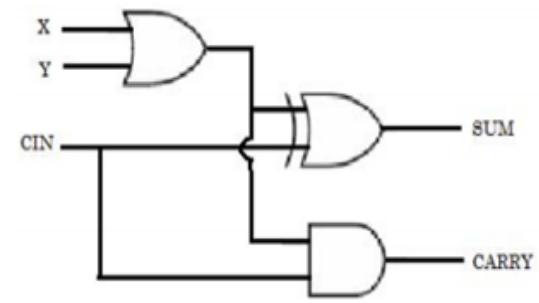

Fig.5. Logic Structure of the Modified 3-bit Approximate Full adder

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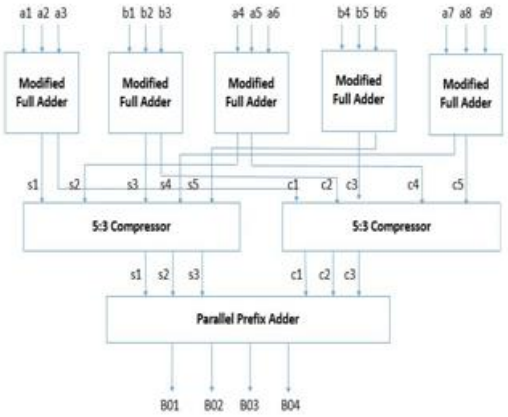

Fig.4. Logic Diagram of Approximate 15-4 Compressor using Modified Approximate Full Adder

5:3 Compressor circuit

15-4 compressor or compactor is made up of two 5-3 compressors in order to obtain 3 respective compressed outputs [18]. The 5-3 compressor applies 5 initial inputs such as S01, S02, S03, S04, and S05 and produces three outputs namely S01, S02 and S03. In the same way, another 5-3 compressor is used to obtain the results from carry inputs namely$C_1, C_2, C_3, C_4\ and\ C_5$. Yield at compressor is being determined by the number of 1's in the place of the input and further implemented by the property of counter. The design of compression of given 5 inputs into 3 output is called the design of 5-3 compressor. Error rate of 5-3 compressor is considered. The design equations of 5-3 approximate compressor are shown in following equations respectively. The logic diagram of approximate 5-3 compressor is as shown in Fig 6.

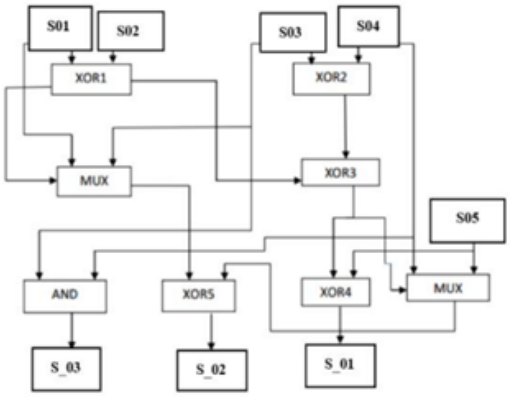

Fig.6. Logic diagram of 5-3 compressor

Parallel Prefix Adder

Parallel-prefix structures are found to be common in high performance adders because the delay is logarithmically proportional to the adder width. PPA's basically consists of 3 stages:

1. Pre-Processing: In this stage, the generate and propagate signals are given by the equations:

$$P_i = A_i \oplus B_i$$

$$G_i = A_i . B_i$$

2. Generation of carry: In this stage, carries are calculated with their corresponding bits and this operation is executed in parallel manner. Carry propagation and generation are used as intermediate signals. The logic equations for carry propagate and generate are shown below.

$$G_i = \left(P_i G_{iprev}\right) + G_i$$

$$P_i = P_i . P_{iprev}$$

3. Final Processing: In final processing, the sum and carry outputs bits are computed for the given input bits and the logic equation for the final processing stage is given by:

$$C_i = G_i$$

$$S_i = P_i \oplus C_{i-1}$$

Here we consider 2 different PPA's: Kogge Stone Adder (KSA), Brent Kung Adder (BKA).

Kogge Stone Adder

Peter M. Kogge and Harold S. Stone introduced the concept of efficient and high-performance adder called kogge-stone adder. It is basically a parallel prefix adder. This type of adder has the specialty of fastest addition based on design time. It is known for its special and fastest addition based on design time [3]. This has regular layout which makes them favored adder in electronic technology. It has the minimum fan-out. The maximum fan-out is 2 in all the logic levels for all width Kogge-stone prefix trees. The key of building any prefix tree is to implement the structure according to the grey cell and black cell logic. The number of stages for a Koggestone adder is calculated by$\log 2^N$. Number of cells is calculated as$N\ (\log 2^{N-1}) + 1$. It consists of 34 BC's and 15 GC's. The KSA acquires extra area when compared to Brent-Kung adder, but KSA has lesser fan-outs at each phase, which rises execution. In Fig 7 the Tree diagram of an 8-bit Kogge Stone Adder is shown.

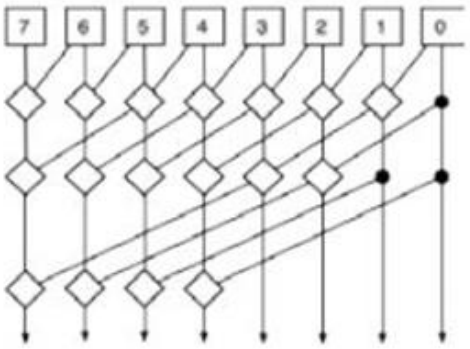

Fig.7. Kogge Stone Adder Tree Diagram

Brent Kung adder

Brent & Kung described this clever modification, which just computes the left-most column in a binary tree, and then fills in the intermediate columns in a reverse tree. The Brent Kung Adder tree diagram is shown in Fig.8. The Brent Kung adder computes the prefixes for 2 bit groups. These prefixes are used to find the prefixes for the 4 bit groups, which in turn are used to compute the prefixes for 8 bit groups and so on. These prefixes are then used to compute the carry out of the particular bit stage. These carries will be used along with the Group Propagate of the next stage to compute the Sum bit of that stage. Brent Kung Tree will be using$2log_2N-$ stages. The large number of levels in Brent Kung Adder (BKA) however reduces its operational speed. BKA is also power efficient because of its lowest area delay with large number of input bits.

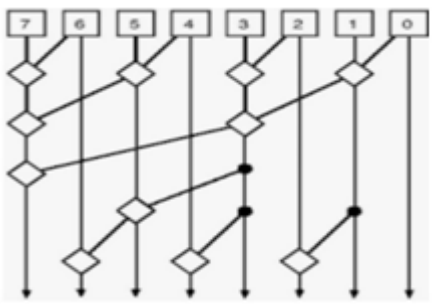

Fig.7. Brent Kung Adder Tree Diagram

SIMULATION RESULTS

The model of 16x16 bit WTM utilizing the 15-4 compressor with modified full adder and Parallel prefix adders (KSA, BKA) is developed with VHDL, using the software Xilinx ISE 14.7. The following simulations are done:

Modified Approximate Full Adder

Initially, coding was done using VHDL and simulated for a basic modified full adder. The RTL view of Modified Full Adder is shown in Fig.8.

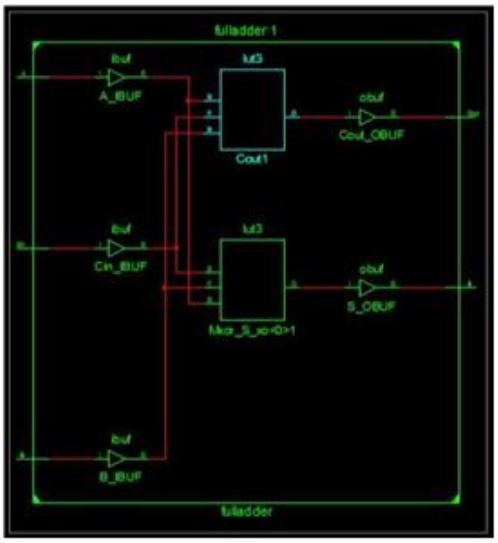

Fig.8. Register Transfer Level View of Modified Full Adder

Kogge Stone Adder

In the next step, the modified 8-bit Kogge-Stone adder is simulated. The RTL schematic is as shown in Fig.9. The red path in RTL view of KSA are the routing and data path and the green blocks represent the grey and black cells and the gates inside the cells are represented in green.

Brent Kung Adder

In the next step, the modified 8-bit Brent Kung Adder is simulated. The RTL schematic is as shown in Fig.10.

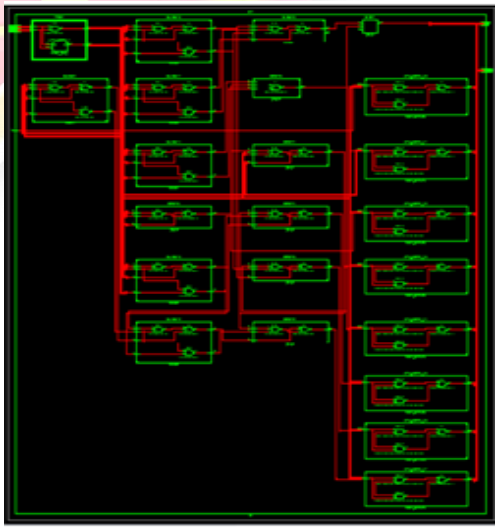

Fig.10. Register Transfer Level View of Brent Kung Adder

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Proposed WTM

In the final step, the 16x16 bit WTM is designed using the BKA and modified approximate Full adder and synthesized using the software Xilinx ISE 14.7. Compared the result with the conventional method using KSA. The RTL view and simulation results of the proposed system shown in Fig.11 and 12.

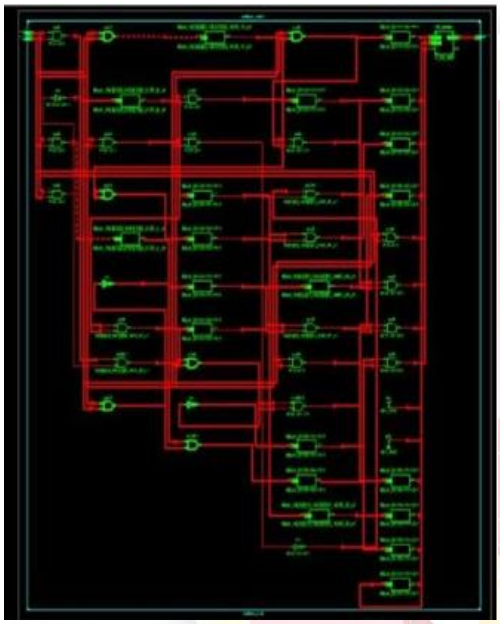

Fig.11. RTL view of Proposed System

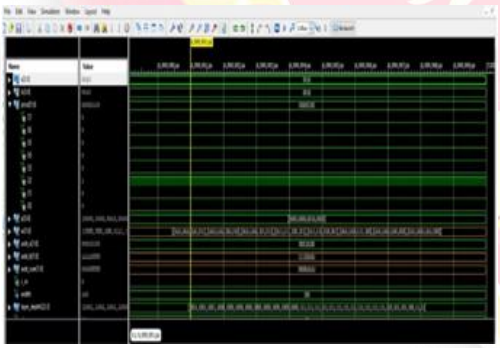

Fig.12. Simulation Result of Proposed System

ANALYSIS OF PROPOSED METHOD

The proposed method is analyzed by power consumption and area utilization. It clearly illustrates results than more types Of adder at a distance from that it provides fewer area. The proposed method also provides least power consumption compared to conventional methods which is listed in Table 1 and 2. The Approximate 16x16 multiplier which consists of 15-4 compressor has been comparatively analyzed among existing adders at the last stage as an alternative of KSA.

Table.1. Power Analysis of 16x16 WTM

Name	Power for KSA (W)	Power for BKA (W)
Clocks	0.015	0.011
Logic	0.001	0.001
Signals	0.003	0.002
IOs	0.002	0.004
Leakage	0.012	0.008
Total	0.033	0.026

Table.2. Device Utilization of 16x16 WTM

Logic Utilization	Used	Available	Utilization
Number of Slice registers	1056	4800	22%
Number of Slice LUTs	40	63400	0%
Number of fully used LUT-FF pairs	0	20	0%
Number of bonded IOBs	25	210	12%

Instead of KSA different PPA's can be used. Here, we mainly focus on KSA and BKA and compared their result. The distinguishing results in reference to the number of LUTs occupied with its power are calculated and listed in Table 3. From the obtained results it is observed that the proposed method is superior to all the existing methods. WTM with BKA provides lesser delay, low area and somehow low power dissipation. Since power dissipation is not much better for the proposed system with BKA it provides some improvement from conventional method.

Table.3. Analysis of different Multipliers

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Categories of Multiplier	LUTs Used	Power (Mw)
16x16 bit multiplier with 15-4 compressor	5066	56
16x16 bit multiplier with KSA	1570	42
16x16 bit multiplier with Modified adder KSA	1332	37
16x16 bit multiplier with modified adder and BKA	1056	26

CONCLUSION

The 16x16-bit WTM is designed using the parallel prefix adder (KSA, BKA) and modified approximate Full adder and synthesized using the software Xilinx ISE 14.7. The performance of proposed Multiplier with Kogge Stone Adder and Modified Full Adder is compared with the same architecture of multiplier using Brent Kung Adder. It can be inferred that 16x16 multiplier architecture using 15-4 compressor with Brent Kung Adder and modified Full adder is faster compared to multiplier with KSA. And from the obtained results it is observed that the proposed method is superior to all the existing methods. In future the BKA is replaced by different PPA's in order to improve the power consumption and the area can be reduced by different modifications. Also the performance of the proposed multiplier can be improved and applied in applications like video and image processing.

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Detection and Classification of Ransom ware Bit-coin Transactions using Machine Learning

Sabira Karim[1], Shemitha PA[2]
[1]UG Scholar, Department of Computer Science and Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala, India
[2]Assistant Professor, Department of Computer Science and Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala, India

Abstract – Ransmware transactions are mostly coming in crypto-currencies. In this paper I am proposing the different approaches in machine learning for efficient identification and classification of the Ransom ware payments done in Bit-coin transactions. The machine learning approaches are evaluated based on the patterns differentiating such cybercrime operations from normal bit-coin transactions in order to identify and report attacks. I have applied Random Forest and SVM to build this model. These machine learning approaches are evaluated based on Bit-Heist Ransom ware dataset which is publicly available. Experimental results show that this model achieved improved detection rate skill of the model in classification.

Introduction

Bit coin is crypto currency introduced in 2008 by Satoshi Nakamoto. Bit coin is the the known crypto currency. It had been introduced in 2009 using an open source code. It is a digital banking system without a physical banking central system without any specific country of origin. Bit coin could be a decentralized type of payment system where the public ledger is properly supported in a distributed manner. The unknown anonymous members called miners, executing a protocol that maintains and extends a distributed public ledger that records bit coin transactions is called a block chain. Block chain is implemented as a chain of blocks. Bit coin is the best-known crypto-currency industry. The transactions of bit coin are completely digital and unknown to a great extent. This situation has led many cyber-crime perpetuators to use bit coin as a safe haven for illegal transactions such as Ransom ware payments. Ransom ware is malicious software that affects the payments gateway in return of ransom that has to be paid. Machine Learning approaches may be employed to pore over The previous transactions as training data in order to correctly predict the individuals or groups to whom Ransom ware payments are being made. This paper tries to explore the efficacy of different machine learning approaches in detecting such payments.

RELATEDWORK

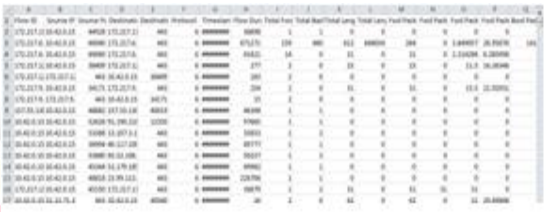
There is a huge increase in the number of online users investing and trading bit coin. However, the obscurity by the crypto-currencies was misused by hackers or Ransom ware operators. This paper aims to identify ransom payments in crypto-currencies, especially in terms of bit coins. I have conducted several studies. Agcora et al [1] have utilized topological ransom ware data analysis techniques to automatically determine new malicious addresses within the Ransom ware family. The authors have designed a bit coin graph model as a directed weighted graph. New addresses belonging to the Ransom ware family are identified based on the payments made to the known addresses of Ransom ware family. Initially, the Ransom ware addresses are grouped into 20,000 groups. The resulting groups are then analyzed for any relation between Ransom ware families. Both Topological Data Analysis (TDA) as well as DBSCAN clustering algorithm are employed to detect and predict Ransom ware transactions. Liao et al [2] have performed analysis on Crypto Locker, a family of Ransom ware. A framework which automatically detects the ransom payments made to bitcoinaddress that belong to the Crypto Locker. The block chain analysis and data sourced from the online forums such as reddit and BitcoinTalk were utilized to make measurement analysis on the data. The timestamps based on the ransom payments made by the victims are then extracted. Using this data analysis, the trends in the time series ransom amounts

were paid were analyzed. Conti el al [3] explored the safety and privacy issues in bit coin. The work mentioned how the veil of anonymity provided by the bit coin ecosystem is encouraging the cyber criminals to resort to illegal and banned activities such as ransom ware, tax evasion and money laundering. Turner et al [4] have tried to research the transaction patterns of ransom ware attacks. The patterns are analyzed to collect intelligence to counteract the Ransom ware attacks. Ransom ware seed addresses were used to model a target network for pattern analysis. Different graph algorithms were used to analyze the cash-in and cash-out patterns. The show distinguishable ways related to the input and output side of the Ransom ware graphs. Huang et al [5] have performed measurement analysis of Ransom ware payment data including the details regarding the victims as well as operators. A comprehensive dataset from multiple data sources such as Ransom ware binaries, victim telemetry as well as vast list of bit coin addresses was formed. This data was used to bit coin-trail right from when the victim aquiresbitcoins to the point where the operators cash out the bit coins. The results claim improved coverage and detection of the Ransom ware when compared with existing algorithms. Alhawi et al [6] have proposed Net Converse which uses J48 primarily based decision-tree classifier to detect Ransom ware samples from features that were derived from network traffic communications. Results show his approach returned better detection when compared to other conventional machine learning approaches such as Bayes Network, K-Nearest, Multi-layer perception, Random Forest and Logistic Model tree. Poudyal et al [7] have proposed a framework for investigating ransom ware using machine learning techniques. Evaluation of the eight machine learning techniques has been conducted at two levels viz., assembly and dll programs. The results indicated that the ransom ware detection rate of more than 90%.

DATASET COLLECTION

The dataset for training the machine learning algorithms on the ransom ware payments over bit coin network is sourced from [1]. The datset was taken from the bit coin transaction graph from 2009 January to 2018 Dec. Daily transactions from the network were extracted and therefore the network links having but zero less than 0.3 billion were filtered out as ransomware amounts were typically on top of this threshold. The dataset contains twenty four thousand four hundred eighty six addresses selected from 28 ransom ware families.

Table1 bit-heist dataset



The "Bit Coin-Heist Ransom ware Address Dataset "contains nine descriptive attributes and a decision attribute. A summary of the dataset is given in Table 1.

Table2: Labels in the dataset

Attribute Id	Attribute Name	Attribute Type	Category Description
1	Address	String	Address of the transaction. The transaction could be ransomware or white
2	Year	Integer	Year of transaction as integer
3	Day	Integer	1 is and 365 is last day of the year
4	Length	Integer	Number of non-starter transactions on its longest chain.
5	Weight	Float	Sum of fraction of coins that originate from starter transaction and end up reaching the address.
6	Count	Integer	Number of starter transactions connected to the address through a chain
7	Looped	Integer	Number of starter transactions connected to the address with more than one directed arc
8	Neighbors	Integer	Number of transactions which have the address as output
9	Income	Float	Total number of coins output to the address
10	Label	String	The class to which the transaction belongs to. either white (non-ransomware) or ransomware (one of the 27 ransomware families)

Table 1:- Description of the Bitt coinheistransomware Address dataset

The bit coin transactions have been developed as a Bit coin Graph model with the help of a directed acyclic graph (DAG). Along with the bit coin address and its year and day time stamp, six other features also have been associated with the address. The attribute income is used to represent payment made in number of bit coins. The attribute length is employed to identify the number of non-starter transactions on the longest chain. A starter-transaction is any one of the sooner transaction in a 24-hour window which did not receive any payments. The attribute weight corresponds to the fraction of Coins originating from the starter transaction and ultimately ending up at the corresponding bit coin address. The attribute length defines the quantity of non-starter transactions in its longest chain. The chain is enforced as a directed acyclic graph, originating from any starter transaction and ending at given address. Count attributes defines the quantity of starter transactions connected to the given address. Loop of an address is that the range of starter transactions connected to the address via more than one directed path. Each of the transactions within the dataset are related to a label indicating

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whether the transaction is white (benign) or belongs to one of the 27 ransom ware families. The dataset is a multiclass dataset which is extremely imbalanced in nature. A dataset is said to be imbalanced if the representations of various classes are roughly not equal. The class distributions of the attribute label are represented in table2. The percentage of imbalance of the foremost frequent ransom ware category viz., paduaCryptoWall with respect to the majority white class is 0.46%.

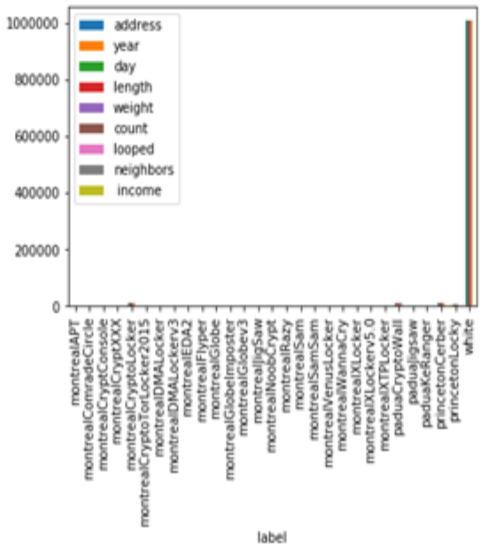

Figure1: Histo plot of Class Label

The representation of other less frequent ransom ware families is almost negligible. Most of the conventional classifiers driven by accuracy-based evaluation metrics may fail in effectively predicting the ransom ware attacks. This work focus to study the effect of different classifiers in such extremely imbalanced data.

Table3: Families of Ransom ware

Class	Label	Frequency	Class	Label	Frequency
0	white	2875284	14	montrealWannaCry	28
1	paduaCryptoWall	12390	15	montrealRazy	13
2	montrealCryptoLocker	9315	16	montrealAPT	11
3	princetonCerber	9223	17	paduaKeRanger	10
4	princetonLocky	6625	18	montrealFlyper	9
5	montrealCryptXXX	2419	19	montrealXTPLocker	8
6	montrealNoobCrypt	483	20	montrealCryptConsole	7
7	montrealDMALockerv3	354	21	montrealVenusLocker	7
8	montrealDMALocker	251	22	montrealXLockerv5.0	7
9	montrealSamSam	62	23	montrealEDA2	6
10	montrealGlobeImposter	55	24	montrealJigSaw	4
11	montrealCryptoTorLocker2015	55	25	paduaJigsaw	2
12	montrealGlobev3	34	26	montrealSam	1
13	montrealGlobe	32	27	montrealComradeCircle	1
			28	montrealXLocker	1

DATA PREPARATION AND MODELING

As the part of preparation of data to this model, we can split the data using hold out method and bagging. Then to build individual models and homogenous ensemble model for each machine learning algorithm. Finally tune the model performance. Machine Learning algorithms can build a heterogeneous ensemble with best performance. Then we will check for the variance in results using k-fold cross validation.

When creating appropriate training and testing splits for the classification models using hold-out method, all the classification models using will be built by using 2 splits of data to check the variance and performance. One set will be the main 75-25 split and other is 3 training and 1 testing dataset each with 25% of the data created using bagging with replacement. Cross-validation gives this model the opportunity to train on multiple train-test splits.

EXPERIMENTAL RESULTS

All the experiments were conducted on Intel Core i7-6500U CPU 2.5 GHZ PC with 16GB of RAM running 64 bit OS machine. The implementation is completed using Python Programming language on Jupiter Notebook. The experiments on “Bit coin Heist Ransom ware address dataset” are performed with randomly selected training data and validation data Machine Learning Approaches.

Machine Learning Approaches

The machine learning approaches performed in this paper for building classification models for predicting the Ransom ware attacks are Random Forest, SVM and k-Nearest Neighbor. Random Forest (RF) is an ensemble classification framework that is depends on the predictions from multiple weak learners, so as to form a one unified prediction. The ensemble approaches have been proven to perform higher than conventional classification approaches, and ease the issues faced by the individual constituent classifiers. Random Forest approach creates a set of multiple decision trees. The constituent decision trees are fed the data by applying random subset sampling on the instances as well as features. The predictions from these decision trees are aggregated to obtain the unified prediction. K-nearest neighbor (k-NN) is a lazy learning approaches in this the model for generalizing the provided training dataset isn't prebuilt before examining the unknown instances. K-NN represents the provided training

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instances on the feature space in terms of similarity measures. K-number is user specified parameter which selects the k number of training instance "closest" to a given unknown instance. The nearest neighbors are estimated using classical distance measures (Euclidean, Manhattan, or Murkowski) for continuous variables and hamming distance for categorical variables. Consensus among these measures provides the predicted class label for a given unknown instance.

Evaluation Metrics

The classification models recommended by the training algorithms cannot be deployed directly as models derived from active learners suffer from the over-fitting drawback. The classification model is validated against a separate test dataset. Once the evaluation parameters for classification model are based on the confusion matrix. Confusion matrix is comprised of TP (True-Positive), TN (True-Negative), FP (False-Positive), FN (False -Negative). The most analysis metrics evaluated are Accuracy, Precision, Recall and F1-Measures. Accuracy is outlined as proportion of total number of prediction made that is correct. True Positive Rate is measured as the ratio of correctly classified positive examples to the total number of positive examples. Precision is another widely used metric in information retrieval which estimates the percentage ofrelavant objects out of the retrieved ones. Recall corresponds to the number of relevant instances retrieved out of all relevant ones. F1-measure is the harmonic mean of Precision and Recall. Accuracy has been shown in many studies is biased towards majority class. In case of the bitcoindatset which is extremely skewed in nature, accuracy may not be considered an as good evaluation metric. Hence the results were drawn on the testing dataset for Precision, recall and F-measure values.

Results

The validation dataset corresponds to 10% of the randomly sub-sampled instances from the BitcoinRansomware dataset. The addresses are well as the class label attributes of the entire dataset have to be transformed using Label encoding process for some classification algorithms to begin modeling data. The resulting class label and the frequency counts of individual class labels are provided in the result tables for clear understanding. The validation dataset also can be noticed as extremely imbalanced in nature. The results in terms of Accuracy, Precision, Recall and F1-measure are depicted in table4.

Table4: Accuracy of different models

Class	Accuracy	Precision	Recall
Random Forest	0.99	0.99	0.99
K-NN	0.97	0.97	0.97
Naïve Bayes	0.58	0.92	0.58

The above table shows that Naïve Bayes Classifier did not perform well on the dataset whereas other classifier returns good values. The k-nearest neighbor algorithm was able to correctly identify instances belonging to the minority classes. K-nun is a lazy classifier which postpones the classification task until the unknown instance is provided. The prediction is based on the consensus from 'k' similar training instances. It may be observed that k-NN correctly identifies fraud classes better than naive Bays classifiers. Random Forest is an ensemble formed from base classifier of decision trees. The weak learners are trained on the data obtained by applying random subset sampling on the set of instances and features as well. This process ensures least correlation among the constituent decision trees. The class imbalance did not have as much effect on Random Forest as it did on Naïve Bays and k-NN algorithms.

CONCLUSIONS

This paper investigates the effect of different supervised machine learning approaches for effective identification ofBitcoin payments for Ransom ware perpetuators. Dataset considered is a multi-class extremely imbalances in nature. Results on different evaluation metrics indicate that the Random Forestwithk-fold cross validation algorithm could correctly identified more of the attack classes. The findings of the algorithms need further exploration on the datasets having extreme class imbalances as well. More emphasis may also be provided to classifiers which consider the representatives of the minority classes from the training data for making better reductions. Future work may also be done to validate the results on more recent spurious bit coin transactions involving

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cybercrime such as ransom ware payments and money launder.

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Review on Major Challenges Faced by Civil Engineering Professionals in the Execution of their Profession

Ashly Joseph1, Gayathri M2
[1,2] Assistant Professor, Department of Civil Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala

Abstract – Civil Engineering is that part of engineering that deals with the application of mathematical and scientific knowledge to improve infrastructures like bridges, dams, buildings, roads, railways and dams and common utilities to help improve human lives and our society. The civil engineering profession involves a lot of sub- disciplines and deals with the design, construction, and maintenance of the built environment. Civil engineers have that social responsibility to properly maintain and adapt structures that we depend on in our daily life and are also involve in making sure the infrastructures are adapted to meet natural disaster, population growth and climate change challenges. They have that responsibility to find and implement solutions to complex problems. However, these engineers face many challenges in executing their duties or carrying on their responsibilities effectively. These challenges have a lot of impact in our society, our environment and the economy of every nation. A literature review of some of these challenges and their impacts to society, environment and the economy are looked upon in this paper.

***Keywords:** Civil engineering; Engineers; Challenges; Infrastructures; Construction; Development; Environment; Developing Countries; Government; Community; Sustainable; Safety; Management; India; Social; Political and Economic*

INTRODUCTION

Engineering is the application of scientific and mathematical principles, experience, common sense and judgment to practical purposes of the design, analysis and operation of structures, machines and systems. As indicated by Albert Einstein, "Scientist investigates that which already is. Engineers create that which has never been". As define by the Accredited Board for Engineering and Technology (ABET), Engineering is "the profession in which knowledge of the mathematical and natural sciences gained by study, experience, and practices applied with judgment to develop ways to utilize, economically, the materials and forces of nature for the benefit of mankind". Engineers are concerned with the application of mathematics, ingenuity and scientific knowledge to develop solutions for technical problems. Civil Engineering is that part of engineering that deals with the application of mathematical and scientific knowledge to improve infrastructures like bridges, dams, buildings, roads, railways and dams and common utilities to help improve human lives and our society. These improvements are done while ensuring that structures and utilities are safe, they should also be environmentally and economical good. The civil engineering profession deals with the design, construction, and maintenance of the built environment. Civil engineering is a big profession that involves a range of different sub-disciplines or specializations. These include; construction engineering, structural engineering, water resources engineering, geotechnical engineering, transportation engineering, municipal or urban engineering, environmental engineering, materials engineering, coastal engineering, architectural engineering and surveying. Civil engineers don't only have that social responsibility to properly maintain and adapt structures that we depend on in our daily Life, they are also involving in making sure the infrastructures are adapted to meet natural disaster, population growth and climate change challenges. They have that responsibility to find and implement solutions to complex problems. However, these engineers face many challenges in executing their duties or carrying on their responsibilities effectively. These challenges have a lot of impact in our society, our environment and the economy of every nation. A literature

review of some of these challenges and their impacts to society, environment and the economy are looked upon in this paper.

SOME MAJOR CIVIL ENGINEERING CHALLENGES

The Cambridge dictionary defines challenge as, "the situation of being faced with something that needs great mental or physical effort in order to be done successfully and therefore tests a person's ability". Due to the pivotal role civil engineering plays in the development and improvement of societies,

SUSTAINABLE CONSTRUCTION

The concept of sustainable construction involves a wider range of concern and poses a lot of challenges and complexities. Sustainable construction involves solving conflicting issues that exit between competing goals and at same time pursue environmental quality, social equity and economic prosperity. They concluded by advising that, the construction industry needs to advance its processes of creating the built environment as it is an important aspect in the debate of sustainability. In order to effectively evaluate Infrastructures for Economy and Sustainable Construction, government should make sure standard and policies that relates to infrastructure development are well addressed and handled in a holistic manner. Again, contracts should be effectively evaluated and good consulting and construction services should be put in place to properly implement the projects. An expert task forced assembled by the ASCE TCCIT (Technical Council on Computing and Information Technology) Data Sensing and Analysis (DSA) Committee identified nine major challenges that are currently faced by the civil engineering professionals. These major challenges are

1. The improvement of safety on construction site
2. Proper management of groundwater
3. The monitoring and improvement of poor and degrading infrastructure
4. The reduction of soil erosion
5. Reducing traffic congestion
6. Disaster improvement management through infrastructure resilience
7. The Estimation of sea levels
8. The improvement of energy efficiency in building
9. The improvement of construction productivity

The first three challenges listed above will be discussed in this paper with their societal economic and environmental impacts to the community. Safety on construction site is the avoidance and protection of workers from having, injuries and fatal accidents which might result to death. The civil engineering sector is one of the world's largest sectors with its numerous constructions, maintenance and demolition works. While statistics from developed nations shows that the rate at which construction workers die as a result of fatal accidents triple or quadruple those workers in other sectors, the death rate of construction workers in developing nations is suggested to be 3 to 6 times higher than those of developed industrialized nations. In their line of duty, construction workers are exposed to hazards including but not limited to asbestos, harsh weather conditions, manual handling of heavy loads, heavy noise, falls from height, dust emission, struck by equipment, hands arm vibration from tools, electrocution and just to mention a few. Civil Engineering professionals and other professional organizations are faced with the challenge of putting in place firm rules and regulations to be respected by the workers so that the rate of fatal injuries that result to the death of the workers can be reduced. They are bound to educate the workers to understand that their performance is partly dependent on their safety. While the studies of organization safety, cultural and post-accident investigations in developed nations help these professionals to be able to put in place such Safety rules and regulations, those of developing nations like India find it difficult because post-accident investigation is hardly done and thus data of such accidents are hardly kept for future use. Developing countries lack accurate data on which they can base their decisions on and establish and implement safety programs like in developed countries, health and safety programs are still at their infancy stage in some developing countries, some developing countries have these programs in place but fail to implement them properly. These accidents and or death on construction sites impact the economy as they can lead to higher cost of insurance, higher premium to compensate the workers or their families and loss of some workdays. The company might incur most cost on training new workers to replace the injured worker or the one who is

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death; there will be damages to the project as productivity will be lost. While the societal impact of such accidents or injuries to the company might lead to loss of public confidence to the company, decrease in the morale's of other workers and loss of customer's satisfaction, this can also lead to depression to some affected family members and loss of societal welfare that might consequently affect the quality of life. There are hidden costs which are incurred indirectly because of environment impact for the wider community despite the clean-up and management of some accidents related to construction such as spill of hazardous substances and fire. These costs are neither quantified nor well understood (ibid).

PROPER MANAGEMENT OF GROUNDWATER

Since 1950, the use of groundwater has been on a constant rise as a result of increase in population growth and economic developing, thus putting more pressure on the proper management of this natural resource. The sustainability of the welfare gains groundwater development has created is a major challenge face by the world today. While in the industrialized world some advanced experiential knowledge has been developed to properly manage groundwater in various uses and context, the application of this knowledge intelligently in the proper management of groundwater is a big challenge in Asian and Indian countries today where the increasing use of groundwater for irrigation to support livelihoods has become a threat to groundwater itself. The use of pump wells for groundwater development for municipal, industrial and agricultural supplies has been on the rise since 1950. About 750-800 Km3 of groundwater is used annually in the world. The excessive use of this groundwater in many places has led to groundwater depletion in those places, thus causing damage to aquatic ecosystem, decrease in well yields, poor water quality, increase in pumping cost and increase in subsided land. Based on the predictions of climate change and some concerns for aquifer systems and groundwater goods and services which are associated to the systems, there will be further stress on water. The groundwater governance regime of most developing countries doesn't have the capacity to assure sustainable resource regulation and allocation in an effective manner. Uncertainties such as socio-economic growth, poor protection, and poor governance structure affecting resource use, global climate change, poor regulation and poor implementation of alternative strategies needed to attain sustainable management are some of the issues that are hindering the management of groundwater. Predictable variations in groundwater drought vulnerability are scarcely planned for or acted upon. The neglect of ecosystems and the associated goods and service; undervaluation of groundwater importance and significance; the centralization of power; and the need for expertise and information at all scales are the four major challenges. Economically, the depletion of ground water can lead to increase in cost due to an increase in the lifting distance and more energy required for pumping that will serve as more burden to end users. There will equally be increase in state budget for wastewater treatment. The social impact of poor management of groundwater cannot be over-emphasizing as our daily lives greatly depend on groundwater for cooking, drinking, cleaning etc. A continues decrease in groundwater will pose an increasing issue on our daily lives. The contamination of underground water poses great risk to groundwater quality. If not well managed, toxins or contaminants in underground water can endanger the lives of aquatic plants and animals and the underground ecosystem, thus causing great impact to the environment. While considering the complex system linkages between political, hydro geological, environmental and socio-economic domains, an adaptive water management is a suitable approach for good groundwater resources governance. The developments of supporting principles, such as cooperation tools, networks for participation and information that can enable the implementation of adaptive water management approaches that can lead to institutional change in the groundwater management are suitable means to tackle the groundwater management challenges.

THE MONITORING AND IMPROVEMENT OF POOR AND DEGRADING INFRASTRUCTURE

Infrastructure is the combination of critical facilities and fundamental systems that support a community, region, or country. This includes transportation systems, dams, and schools, underground lifelines (e.g. water, telecommunication conduits, sewage, and electricity). There is the fast-degrading rate of infrastructures in developing countries in India like

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India which needs some attention and investment in their improvement. In order to get accurate data on the state or health of the infrastructures to make an informed decision on what to do or measures to take for its improvement or rehabilitation, there is need for appropriate health monitoring of the infrastructures. There is a need for the Civil Engineering community to have accurate methods of global displacement measurement for use in construction and monitoring the health of infrastructures. There is the need to consider the structure performance and the accrued cost of the entire life cycle to effectively carry out maintenance and management of civil infrastructure in a cost-effective manner. Single maintenance and management solutions do not yield satisfactory structure performance for a long term. Performance of structure is usually described by the visual inspection-based structure condition states. There has not been adequate consideration on actual safety level of the structure at time when decisions to determine maintenance management are being taken (ibid). A large number of civil structures in India in general and India in particular have been designed and constructed according to outdated codes of practice. The age of the structures and actual performance of the construction materials affect the overall behavior of the existing buildings to a great extent. This is also the case with many Indian countries, where many existing structures no more function adequately due to their age and some structural deficiencies. This makes structural assessment and rehabilitation to become a big challenge in urban management and planning. There is need for evaluation and enhancement of structural safety of already existing structures against earthquakes that results to serious damages and structural collapse. The first step in putting such effective measures in place is to increase the knowledge about the structural behavior of existing structures by providing guidelines which define measures to protect them and decrease the probability of structural damages. While several large research projects have been initiated in the field of civil engineering in developed countries to help in the continuous monitoring of relevant parameters and performance of such structures, similar studies are hard to find in India. The protection of civil structures from seismic actions can be achieved by adopting modern design guidelines for new structures and guidelines to recover and restructure the already existing structures. Advanced Structural Health Monitoring (SHM) and Seismic Early Warning (SEW) systems can be used in the assessment of structural performance of existing structures and evaluate their vulnerability and the subsequent interventions required for the structural rehabilitation. The advancement of Information and Communication Technology in developed nations allow for real-time monitoring of structures. These advanced systems and technologies are hardly found in most developing nations. Even if found, they suffer some setbacks in terms of design, installation, the maintenance of cables and some sophisticated electronic components. Most of the Indian countries still practices structural health monitoring just by visual inspection of the infrastructures. This practice in subjective and time consuming as defects are found and assess visually or manually by use of digital cameras to get photographs. The interruption of certain services (e.g. water mains, electricity lines etc.) is another challenge faced during inspections. In a country like India, the inspectors or technicians at times find it very difficult or almost impossible to accurately locate the infrastructure lines that have been buried long ago. This visual or manual inspection or health monitoring of infrastructures does not provide accurate data or information about the state or health of the infrastructure, thus making it difficult to make informed decision, thus posing a big civil engineering challenge. Economic impact of these challenges is enormous as the aging infrastructures need huge sums of money for their improvement and causes significant economic losses. The need for monitory the health of infrastructure cannot be over emphasize this can provide real-time updates on their condition and thus supports preventive planning and lessens their inefficiencies and associated failures. The failure of certain infrastructure systems maybe very dangerous to the environment and their impact can be felt for long period of time. Many buildings (both public and private) have collapsed in the recent past in India that has resulted to many deaths, idem with road accidents due to poor roads infrastructure in the country. The challenge of identifying the exact location of buried infrastructures may result to the cutting of some

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essential services that may put the safety of the entire public at serious risk.

CONCLUSION

The fast-growing population in the developing nations calls for more infrastructures to be put in place. There is need for maintaining the already existing ones, which are degrading. This is the duty of the civil engineering professionals but they are face with a lot of challenges. The problem of sustainable construction, improvement construction site safety, proper management of groundwater and the monitoring and improvement of poor and degrading infrastructure are seen as some of the major challenges. While those in the developed nations have done a lot of advance research and put strict regulations to manage those challenges, much is still to be done in the developing nations. Research and experience from the developed nations cannot directly be translated and applied to the developing nations to handle these challenges as these countries don't have same environmental, economic and societal conditions. These challenges negatively impact the society, economy and environment of these countries. Advance research and the collection of appropriate data need to be done so informed decision can be made to help put in place strict and appropriate regulations by the developing countries and good governance structures to ensure strict application of the regulations. These challenges have negative impacts on the society, environment and economy of those developing countries like India.

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TURBOCHARGER IN TWO WHEELERS

Gokul K Manoharan[1], Chandranath C M[2], Jishnu Rajan[3], Kripal Krishor[4], Philsher Phillip[5], Anil D Koola[6]

[1,2,3,4,5] UG Scholar, Department of Mechanical Engineering, IES College of Engineering, Chittilapilly, Thrissur, Kerala

[6]Assistant Professor, Department of Mechanical Engineering, IES College of Engineering, Chittilapilly, Thrissur, Kerala

Abstract-Turbocharger is a device that increases the overall performance of engine by reusing the exhaust heat to drive the turbine. A two wheeler engine with turbocharger increases the power of engine and with reusing of exhaust gas which results of less fuel consumption. The immediate objective of this report project is to develop and upgrade two wheeler for commercial purpose as well as racing purpose. The emphasis today is to provide feasible engineering solution to manufacturing economics and "greener" road vehicle. It is because of this reason that turbocharger are now becoming more popular in automobile applications.

Introduction

A turbocharger or turbo is a forced induction device used to allow more power to be produced for an engine of a given size. The key difference between a turbocharger and a conventional supercharger is that the latter is mechanically driven from the engine often from a belt connected to the crankshaft, whereas a turbocharger is driven by the engine's exhaust gas turbine. A turbocharged engine can be more powerful and efficient than a naturally aspirated engine because the turbine forces more intake air, proportionately more fuel, into the combustion chamber than if atmospheric pressure alone is used. The output of the engine exhaust gas is given to the input of the turbine blades, so that the pressurized air produced. This power, the alternate power must be much more convenient in availability and usage. Turbochargers are commonly used on truck, car, train and construction equipment engines. Turbochargers are popularly used with otto cycle and diesel cycle internal combustion engines.

ADVANTAGE OVER SUPERCHARGER

The advantage of turbo charging its stock engine is that you save a lot of money and at the same time obtain better performance. Modern turbocharger is based on the principle that if air entering in an engine is pressurized more oxygen and then adding more fuel in the engine result in higher torque and more power. A turbocharged engine produces more power overall than the same engine without the charging. This can significantly improve the power to weight ratio for the engine. Now a day's turbocharger is used in heavy vehicle, racing cars and racing bikes.

TURBOCHARGING OF IC ENGINE

Turbo chargers are used throughout the automotive industry as they can enhance the output of an internal combustion (IC) engine without the need to increase its cylinder capacity. The application of such a mechanical device enables automotive manufacturers to adopt smaller displacement engines, commonly known as "engine downsizing". Historically, turbo chargers were often used to increase the potential of an already powerful IC engine. The emphasis today is to provide a feasible engineering solution to manufacturing economics and "greener" road vehicles. It is because of these reasons that turbochargers are now becoming more and more popular in automobile applications. The aim of this paper is to provide a review on the techniques used in turbocharging to increase the engine output and reduce the exhaust emission levels.

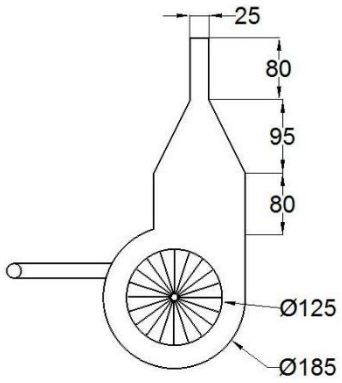
TURBOCHARGING SINGLE CYLINDER S.I. ENGINE

Effect, design and installation of turbo charger s.i. engine are available in this paper. Turbo charger in two wheeler which increase efficiency of engine. Supercharger works on engine

power while turbo charger works on exhaust gases. We aim to increase to volumetric efficiency of Yamaha Libero bike of 106cc and also emission from engine can be control. Small modification is done on vehicle to improve efficiency and control emission.

MODIFICATION OF 106CC PETROL ENGINE WITH TURBO CHARGER

Due to the increase of motorcycles, petrol consumption and emission rate increases day by day. An attempt has been made in this project to use the exhaust gas to rotate a turbine thereby rotating a compressor for supplying compressed air to inlet. A turbocharger increases the pressure at the point where air enters the cylinder, thereby increasing the pressure gradient across the intake valves and thus more air enters the combustion chamber. It allows proper combustion of fuel and increases the efficiency of engine. A turbocharged engine can be more powerful and efficient than a naturally aspirated engine because of the increase in the quantity of intake air into the combustion chamber than if atmospheric pressure alone is used. In this project we used a 106cc engine for our analysis. In our work the turbocharger is mounted in front of the engine near the exhaust ports in order to minimize heat losses and improve turbo response.



All dimensions are in mm.

Figure 1: 2D Drawing

WORKING PRINCIPLE

The turbocharger consist of two sections, the compressor section and turbine section. The turbine section consist of turbine housing in which the turbine wheel is placed. The turbine wheel is connected to the compressor wheel by a shaft, so that when the turbine wheel rotates the compressor wheel also rotates. The compressor wheel is placed inside the compressor housing.

The working of the turbocharger is such that the exhaust gases turns the turbine wheel which in turn turns the compressor wheel that takes up fresh air and provides it to the intake manifold.This results in a greater mass of air entering the cylinder on each intake stroke. Thus increasing power and efficiency.

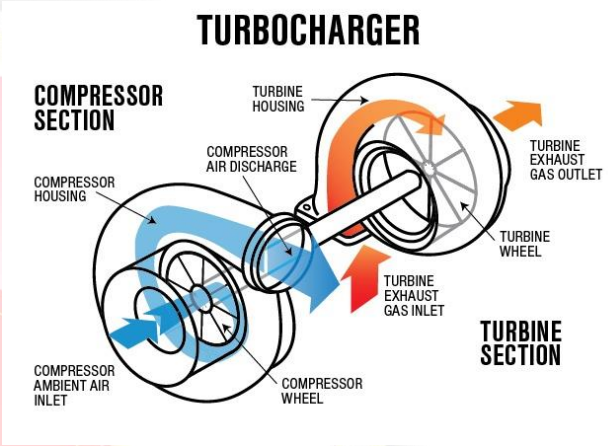


Figure 2: Working of Turbocharger

MAIN COMPONENTS

The main components of the turbocharger are:

FRAME

This is made of mild steel material. The whole parts are mounted on this frame structure with the suitable arrangement. Boring of bearing sizes and open bores done in one setting so as to align the bearings properly while assembling. Provisions are made to cover the bearings with grease.

TURBOCHARGER

A turbocharger, colloquially known as a turbo, is a turbine-driven, forced induction device that increases an internal combustion engine's power output by forcing extra compressed air into the combustion chamber. This improvement over a naturally aspirated engine's power output is because the compressor can force more air and proportionately more fuel into the combustion chamber than atmospheric pressure (and for that matter, ram air intakes) alone.

BLOWER UNIT

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A centrifugal fan is a mechanical device for moving air or other gases. The terms "blower" and "squirrel cage fan" (because it looks like a hamster wheel) are frequently used as synonyms. These fans increase the speed of air stream with the rotating impellers. They use the kinetic energy of the impellers or the rotating blade to increase the pressure of the air/gas stream which in turn moves them against the resistance caused by ducts, dampers and other components. Centrifugal fans accelerate air radially, changing the direction (typically by 90°) of the airflow. They are sturdy, quiet, reliable, and capable of operating over a wide range of conditions.

It has a fan wheel composed of a number of fan blades, or ribs, mounted around a hub. As shown in the animated figure, the hub turns on a driveshaft that passes through the fan housing. The gas enters from the side of the fan wheel, turns 90 degrees and accelerates due to centrifugal force as it flows over the fan blades and exits the fan housing.

It is made up of sheet metal. The fan (impeller) rotates inside the shell. The shell is so designed that the air is rushed out forcedly. The pesticide enters the front portion of the blower. The blower is fixed with the stand. At the one end of the blower the hose is fitted. The air forces the seed to the outer side.

RESULT

SI NO.	FUEL (ML)	TRIAL	KM DRIVEN	AVG. KM
1	100	1	6.4	6.2
		2	6	
2	250	1	16	15.5
		2	15	
3	500	1	32	33.5
		2	35	

Experimental result without turbocharger

Table 2

Experimental result with turbo

SI NO.	FUEL (ML)	TRIAL	KM DRIVEN	AVG. KM
1	100	1	5.5	5.3
		2	5.8	
2	250	1	14.5	13.75
		2	13	
3	500	1	29	30
		2	31	

CONCLUSION

From the study it can be concluded that Turbocharging two wheelers is a good method for increasing the power and efficiency of the single cylinder engine without increasing the size of the engine. It can further reduce the fuel consumption and the exhaust emission to the atmosphere. The engines power output and efficiency increased with the installation of turbocharger.

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Plastic Recycling For 3d Printing Material

Alwin anto[1], Amal ramankutty[2], Amalgosh vinayan[3],

Ameen muhammed[4], Nithin rajan[5]

[1,2,3,4] PG Scholar, Department of Mechanical Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala

[5] Assistant Professor, Department of Mechanical Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala

Abstract –The aim of our project is to compress the plastic material in a barrel and motor with belt arrangement develops the compressing motion. The plastic materials are poured in a barrel. The heater surrounding the barrel heats the plastic material. Then it is converted into molten state. The molten plastic is injected through the nozzle in a barrel to the die by the compressing force

I. Introduction

3D printing or additive manufacturing is a process of making three dimensional solid objects from a digital file. The creation of a 3D printed object is achieved using additive processes. Plastic extrusion process is a manufacturing process in which raw plastic is melted and formed into a continuous profile producing items such as pipe/tubing, fencing, deck, railings, window frames, plastic films, and wire insulation .According to the estimates, every year more than 8 million tons of plastic ends up in the oceans. The use of plastic extrusion machines has increased globally with the increase of plastic production, Due to the large scope of 3D printing this technology has experienced in the recent decades a great development. The main idea of our project came to us when we came to know about an incident happened in Mumbai. where a group of people had motivated waste pickers to sell their plastic wastes to them and they make sure that they earn a better price for it. This waste plastics are used by them to produce filament type material which can be used for 3d printing as its ink. This reduces the cost of 3d printing process as a result we can reduce overall 3d printing cost since ink is one of the most costliest element in the printing process

II. SCOPE OF THE PAPER

Reduce the waste generated in society which would be harmful too by creating pollution. Cost of filament used in 3D printer can be reduced by the usage waste material

III. DRAWINGS

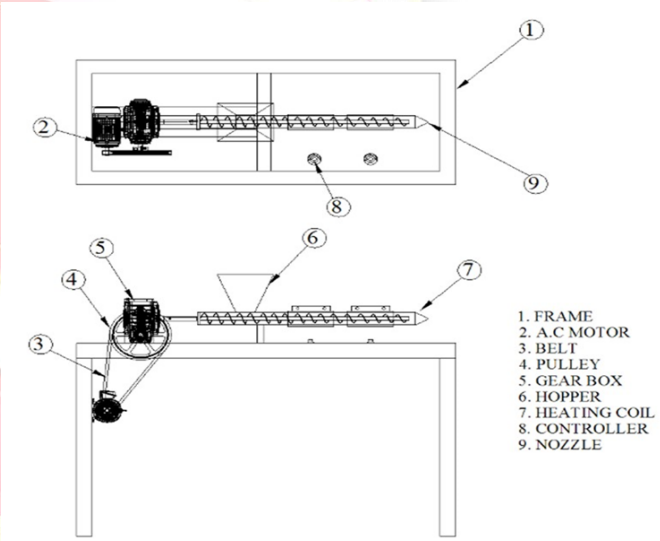

Fig 1 Layout Of The Design

IV. WORKING

This project is based on the process of plastic waste management system. It is consist of mechanical part mainly electric AC motor, hopper, gear box, blades, heating coil , belt, pulley, controller, and nozzle. The crushing units are rotate in direction to squeeze the bottle pieces and the controllers driven by a gear box. The ac motor and belt drive arrangement is mainly used to rotate the recycling unit and the gear box used for the purpose control the speed of the motor .In order to perform this rotation we have adopted meshing

arrangement from the motor.

The machine is provided with the opening at thetopsiderecyclingunit.Thewasteplasticpiecesarekeptinsidethe hopper.Simultaneously the bottle pieces will fall on crushing hopper on the bottle gets melting bythe heating coil. The melting plastics are collected for the purpose of further uses. The main part of the extruder is a barrel containing a screw(also sometimes referred to as an auger) which is connected to a heater toward its far end. On the other end, the screw is connected to an electric motor which will via mechanical action, transport the resin pellets through barrel towards the heater. Pellets are gravity fed continuously from a hopper. As the motor is continuously driving the auger, the resin pellets are pushed into the heater. The ABS pallets will gets often and melt because of the heat from heating band that is evenly distributed by using asbestos ribbon and are then pushed mechanically through a die. Pushing the soft ABS through the die will cause it to form a continuous filament strand with the diameter of die. Screw is used to control the flow and strainer is used to smoothen the flow. Air fan cool down mechanism is used to cool down the filament after coming from the die

V. MODELLING

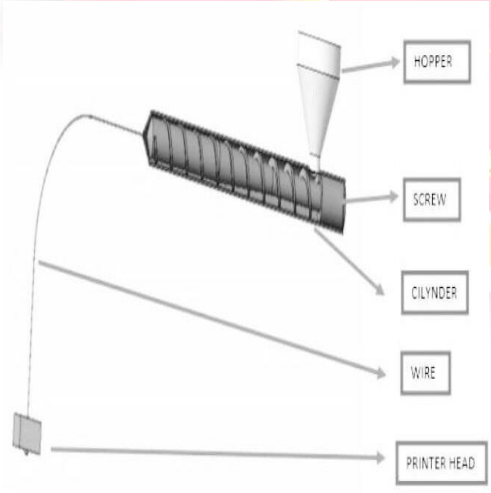

Fig 2 Horizontal 3D Filament Making Machine

Most 3D printers use a wire as feed material, so the first option is to develop an extruder that permits the manufacture of the wire. This allows us to start the process of printing from plastic granulate. The process starts feeding the hopper with the plastic. The screw drags and breaks granulate. The extrusion process continues until the material comes out of the nozzle creating he wire which will be guide by a plastic tube into the printer´s head. Apparently this option is the simplest one but there are some problems to be solved. The biggest problem is when the extruder stops working all the plastic inside the canal lowers its temperature and solidifies. So is not possible to start the process again. Furthermore, as the wire comes out with a high temperature and in a melted way, the material gets stuck into the tubes walls and the printing process is not uniform and it can block the tube.

VI. EQUIPMENT DESCRIPTION

A. SCREW

There are two basic characteristics that the screw should satisfy in order to perform his function correctly. It has to be hard enough to bear with the possible erosion and to be able to handle with high temperatures. The high temperatures will be caused by the movement that the screw has, the friction against the cylinder and the heating system. The material chosen for the screw is steel F-174, which is a nitriding steel. This material is typically used in extruders screws and cylinders and reaches a Vickers hardness of 1048-1064 HV. In addition, it is able to handle with the high temperatures reached inside the extruder, which will be around 200ºC. Steel pieces which have been treated with a nitriding process are usually prepared to stand temperatures up to 500ºC. Also the nitriding process gives the piece an extra layer of protection against the corrosion For the properly development of the extrusion process it is necessary that the screw surface is as smooth as possible, to avoid friction and to allow the plastic slide on it.

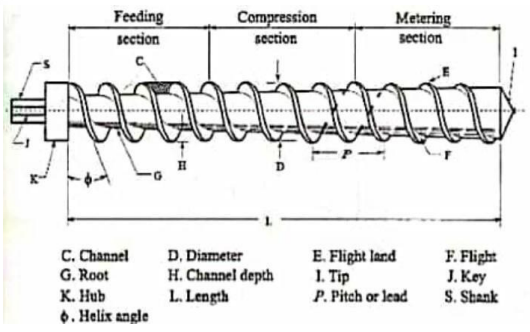

FIG 3. Screw Geometry Details

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The diameter we decide to work with is 25 mm and for the relation between the length and the diameter we choose, 12/1. The reasons to take these measures and not any others are based basically on the fact that the screw has to be the smallest size possible without increasing very much the price. So we consider 25 mm to be the smallest diameter with reasonable price and with precise usefulness. In addition, we choose 12/1 for the relation L/D because we consider 300 mm the maximum length keeping a light screw in terms of Weight, taking into account that if the relation L/D is bigger, the price will be lower. Therefore, I have defined the first parameters of our screw D =25 and L=300. Also they have been taken into account other options of diameters and length.

B. NUMBER OF CHANNELS

The first step to be taken in the process of design a screw is deciding the number of channels on it that is, deciding the number of threads.

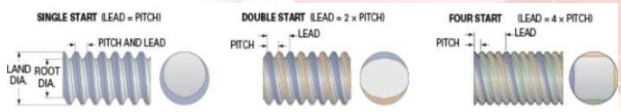

FIG 4. Number Of Channels

In applications where a large flow is required, screws can be used with two or more threads, but in our case the flow is very small so we will use a screw with a single thread. So the number of channels for our extruder m=1.

C. BARREL OR CYLINDER

Just as for the screw, the material chosen for the cylinder is steel F-174, for the same reasons. The cylinder must also be able to handle with high temperatures and be hard enough to resist degradation due to the friction generated between the inner face of the cylinder and the plastic flow. The cylinder is the part in charge of keeping the material inside while going throughout the screw. For this reason, its inner diameter is the sum of the screw diameter and the clearance calculated above, to a total of 25.05 mm. Considering tolerance and according to the availability of standard tube, 1 ‖ ID tube meets our requirement, so we have selected 1 ‖ ID tube for the cylinder.

D. BARREL OR EXTENTION

Barrel Extension material is same as Barrel for the same reasons. It is manufactured by turning operation. It is welded to the end of the Barrel. This extension is used to couple barrel piece to die and to give sufficient thickness to fit the secondary heater. In addition,4 mm thick aluminum strainer is attached to smoothen the flow and 3/8 ‖ nut to control the flow

E. DIE OR NOZZLE

The material most commonly used for die is brass because it has to withstand high temperatures. Likewise, is a good conductor of heat, quality that is needed to heat fast and uniform the nozzle as the printing material needs to be printed around 200ºC. Brass is one of the material with best characteristics and this is why we are choosing it for the nozzle. The nozzle is also one of the most important elements of extruder, as it defines the final shape of the plastic. Between its characteristics we are going to remark its hardness and the fact that it perfectly keeps its conditions for a long period of time. Also, it doesn't get affected by the external conditions. Its characteristics make it one of the best materials in the market but with a lower price. The die that is used is M12 Brass plug with 2mm hole.

F. HOPPER

Hopper is made up of stainless steel sheet metal. There are no specifications for hopper design. Its size varies depending on the application or quantity of production. So the hopper design is just to fulfill the requirement of this project. Hopper is designed as gravity fed hopper. Hopper is wedge type and the flow of solid in the hopper is mass flow. It is cut and manufactured from 6 ‖ x4 ‖

G. MOTOR

The motor for the system is a 55 RPM motor with stall torque of 53 lb-in (61 kg-cm).This motor is controlled by a PWM (Pulse Width Modulation) speed controller. This controller is wired in series with the power source from 24 V supply and the motor. This was the simplest control system. It is a variable speed control system with the RPM is selected by varying the duty cycle

H. HEATER SYSTEM DESIGN

Heaters are located along the barrel, with thermocouples in each zone to control the heaters and barrel temperature. The heaters cover as much barrel surface area as practical, minimizing hot and cold spots along the barrel length. In an

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individual extruder temperature zone, there may be one, two, or three heater bands with one thermocouple controlling them. Assume the heater band closest to the thermocouple burns out; the other two heater bands have to supply all the external energy required, creating the possibility that the area is hotter near the two heater bands that are working. In the event, the band farthest from the thermocouple burns out, the barrel area under the burnt-out heater is anticipated to be cooler than areas where the heaters are functioning properly near the controlling thermocouple. Burnt-out heater bands should be replaced as soon as possible to assure uniform heat input

I. TEMPERATURE ZONE CONTROL

Each extruder temperature zone has at least one heater and possibly multiple heaters controlled by a thermocouple. A signal from the thermocouple communicates with the controller, indicating whether the heater is to be turned on or off. For the controller and heaters to function properly, the thermocouple must operate properly. A faulty thermocouple with an open circuit indicates the temperature is low, resulting in the heaters staying on and causing substantial overheating. A closed thermocouple indicates the temperature is high; heaters remain off and the temperature zone cools. If a thermocouple is not responding properly, it must be replaced.

The thermocouple well in the barrel should be at least 1.2 inches (30 mm) deep and installed away from the heaters. Never sandwich the thermocouple between the heater and the barrel wall; the thermocouple will be responsive to the heater temperature and not the barrel temperature. We have used 35 x 30 mm, 150 Watt heating band.

J. FIXING SYSTEM

What we have called fixing system; it is nothing but the pieces we have designed to set our extruder. This fixation system is responsible for holding the extruder and the rest of the pieces. In addition, the fixing system will hold the fans that cool the filament coming out of die.. Therefore, the pieces we have to design should perform simultaneously three different functions. To start designing the pieces we look at the extruder which we are going to assemble. In addition, the heater system is designed in a way so that the fixing system has to be allocated between both of the heater pieces. So we have designed the fixing system that will cover all the extruder parts. We have used Mild steel square- shaped tube for fixing system designed

VII. COMPONENTS AND DESCRIPTION

A. AC MOTOR

An AC motor is an electric motor driven by an alternating current (AC). The AC motor commonly consists of two basic parts, an outside stationary stator having coils supplied with alternating current to produce a rotating magnetic field, and an inside rotor attached to the output shaft producing a second rotating magnetic field. The rotor magnetic field may be produced by permanent magnets, reluctance saliency, or DC or AC electrical windings. Less commonly, linear AC motors operate on similar principles as rotating motors but have their stationary and moving parts arranged in a straight line configuration, producing linear motion instead of rotation

B. PULLEY

A pulley is a wheel on an axle or shaft that is designed to support movement and change of direction of a cable or belt along its circumference. Pulleys are used in a variety of ways to lift loads, apply forces, and to transmit power. Pulleys are assembled to form a block and tackle in order to provide mechanical advantage to apply large forces. Pulleys are also assembled as part of belt and chain drives in order to transmit power from one rotating shaft to another

C. BELT DRIVE

A belt is a loop of flexible material used to mechanically link two or more rotating shafts, most often parallel. Belts may be used as a source of motion, to transmit power efficiently or to track relative movement. Belts are looped over pulleys and may have a twist between the pulleys and the shafts need not be parallel. In a two pulley system, the belt can either drive the pulleys normally in one direction (the same if on parallel shafts) or the belt may be crossed, so that the direction of the driven shaft is reversed (the opposite direction to the driver if on parallel shafts). As a source of motion, a conveyor belt is one application where the belt is adapted to continuously carry a load between two points. A conveyor belt is the carrying medium of a belt conveyor system (often shortened to belt conveyor). A belt conveyor system is one of many types of conveyor systems. A belt conveyor system consists of two or

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more pulleys (sometimes referred to as drums), with an endless loop of carrying medium—the conveyor belt—that rotates about them. One or both of the pulleys are powered, moving the belt and the material on the belt forward. The powered pulley is called the drive pulley while the unpowered pulley is called the idler pulley

D. FRAME

This is made of mild steel material. The whole parts are mounted on this frame structure with the suitable arrangement. Boring of bearing sizes and open bores done in one setting so as to align the bearings properly while assembling. Provisions are made to cover the bearings with grease.

E. HOPPER

The hopper is used to pour the plastic raw materials in to the barrel.

F. GEAR BOX

Transmission is a machine in a power transmission system, which provides controlled application of the power. Often the term transmission refers simply gearbox uses gears and gear trains to provide speed and torque conversions from a rotating power source to another device

G. HEATING COIL

A typical heating element is usually a coil, ribbon (straight or corrugated), or strip of wire that gives off heat much like a lamp filament. When an electric current flows through it, it glows red hot and converts the electrical energy passing through it into heat, which it radiates out in all directions

H. NOZZLE

A nozzle is a device designed to control the direction or characteristics of a fluid flow (especially to increase velocity) as it exits (or enters) an enclosed chamber or pipe. A nozzle is often a pipe or tube of varying cross sectional area, and it can be used to direct or modify the flow of a fluid (liquid or gas). Nozzles are frequently used to control the rate of flow, speed, direction, mass, shape, and/or the pressure of the stream that emerges from them. In a nozzle, the velocity of fluid increases at the expense of its pressure energy.

VIII .PROS AND CONS

This product is an alternative for plastic crushing. Cheaper and easily available material is used. Quick response is achieved Simple in construction

IX. CONCLUSION

The developments in 3D printing have led to the production of objects made from materials such as plastic, metal, paper and even food. This has given end users the opportunity to explore their creativity. This project work has provided us an excellent opportunity and experience, to use our limited knowledge. We gained a lot of practical knowledge regarding, planning, purchasing, assembling and machining while doing this project work. We are proud that we have completed the work with the limited time successfully. The "PLASTIC RECYCLING 3D PRINTING SYSTEM" is working with satisfactory conditions. We are able to understand the difficulties in maintaining the tolerances and also quality. We have done to our ability and skill making maximum use of available facilities. In conclusion remarks of our project work Thus we have developed a "PLASTIC RECYCLING FOR 3D PRINTING SYSTEM". By using more techniques, they can be modified and developed according to the applications

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USE OF CONSTRUCTION AND DEMOLITION WASTE FOR SUSTAINABLE DEVELOPMENT: A REVIEW PAPER

Naeema Amina Najeeb[1], Renjini R[2], Athulya Varghese[3]

[1,2,3]PG Scholar, Department of Civil Engineering, IES College of Engineering, Thrissur, Kerala, India

Abstract –Any development is considered a sustainable development only if it involves conserving resources for the future. Conservation of resources has become an inevitable concern of this generation, as resources are being depleted at an extremely high rate due to the increasing demand for resources. It has been estimated that the waste produced at a construction site accounts to around 30% of the total weight of building materials delivered to a building site, hence waste management becomes a matter of grave concern. To satisfy the increasing demand of resources while ensuring proper waste management, the very familiar "Reduce, Re-use and Recycle" strategies can be implemented. This paper discusses about how construction and demolition wastes can be re-assembled or used to form new materials that can substitute the use of fresh resources for construction and how much it is being implemented in Dubai and what further measures can be taken to popularize the use of C&D waste in Dubai. There are numerous methods in which this can be achieved, but despite the positive outcomes experienced and proper test results, these resources have not been widely recognized or used. This paper also discusses many significant benefits of using C&D waste for construction such as Protection of Natural Resources resulting from the reduction in the need for extraction of materials from natural resources due to the reuse of C&D materials, Reduction in Landfill Disposal due to the reuse of a large proportion of the waste generated, Energy Savings resulting from the avoidance of raw material extraction and transport, as well as energy gained from combustion of certain wastes, Reduction of Carbon Footprints, since the use of recycled materials in a product or process requires less net energy compared to the use of virgin materials, less fuel is required in the manufacturing process, therefore less carbon dioxide is emitted to the atmosphere and so on. This paper, using a range of case studies as well as journals, highlights the technical viability, challenges, and appropriateness of using different construction and demolition wastes in a wide range of construction applications.

INTRODUCTION

The development of society has resulted in construction activities, which are to be seen everywhere. As construction activities continue, many existing structures which have either outlived their service life or otherwise requiring replacement are demolished. This research aims to study the existing methods of C&DW management around the world and explore the ones that have been initiated and used in the United Arab Emirates. According to the World Bank report, the population in the cities in 2006 was 49.7% of the world population which grew up to 53.75% in 2014, this is an indication of an increased movement of people from villages to city areas, due to which there is an increased demand for new construction projects. The waste generation has accelerated globally due to an increased growth in population, increased urbanization, and growing economy. According to World Bank records the annual global generation is increasing more than ever and has recently reached to about 17 billion tons and is estimated to hit 27 billion tons by 2050. In Middle East, especially in the United Arab Emirates, the construction industry started booming in 1972 after the seven emirates united to form the U.A.E. According to data from the Dubai chamber of commerce and World Bank, the U.A.E has the 28th rank worldwide in GDP with US$360.25 billion.

It is also ranked as Arab world's second largest economy. Construction activities accounts to around 11.1% of the country's total GDP.

BACKGROUND THEORY

In this section, existing research, and literature on improvements in the construction industry with respect to the environmental aspects will be discussed. This review will focus on the various methods of C&D waste recycling adopted in various parts of the world by studying various journal, the conditions of the construction industry in the U.A.E, the waste production undercurrents in U.A.E as compared to other parts of the world. The past two centuries enormous developments were observed in the world especially in the construction sector because of an increased demand on construction projects. After WW2, a major issue arose which was because of the huge damage in many cities in the Europe which resulted in the generation of a lot of concrete ruins. It was from there the concept of concrete recycling started and it began with the crushing of concrete remains to manufacture RA and this was used for manufacturing new concrete thereby reducing the transportation cost of the remains of concrete waste to landfills as well as the cost of producing fresh aggregates, it was also helpful in preventing the rapid expansion of landfills. It was in 1972, UN's 1st conference to execute the sustainability concept took place, a lot of countries were a part of this conference. In 2011 began the first recycling project in the U.A.E. The recycling of C&D waste had not become widely practiced as of the year 2016 and there are a lot of challenges faced in this field. At present the recovery plant has halted for anonymous reasons and the process is done only for very few items like glass, plastic, steel etc. while the most of the C&DW constitutes of concrete and this ends up in landfills. Based on landfill management records in U.A.E, (Tareq Mahmoud, 2016) almost 1500-2000 trips of load with around 20-30 tons of construction waste end up in landfills every day. A worldwide data gathered from various websites as well as journals about the C&DW generation has been documented below.

A. Oceania

New Zealand first established a "waste minimization act" in 2008 to reduce dumping of wastes in landfills and to ensure that waste were well disposed and reused or recycled (Farelly and Tucker, 2014). C&DW here is either disposed at landfills (20%) or in inert landfills (80%). The authorities are working efficiently to decrease the heavy burden from the landfills there. Even though the recycling rates in the Australian states is extremely high, there is still a constant drive to improve the rate of recycling and commitment to attain a rate exceed 70% Under the "towards zero strategy", a target of 80% for recovery of materials has been set at Victoria and the Zero Waste SA Act 2004 discourages disposal of waste at landfills by 25% in South Australia (Hyder Consulting Encycle Consulting & Sustainable Resource Solutions, 2011). The Australian states are looking forward to reusing and recycling materials by using tax imposal methods for waste disposed in landfills. There has been an increase in disposal cost, that is the cost which was 31-76 USD per ton is now increasing at a rate of 7.5 USD per ton every year. The benefits of these strategies are still to be seen in effect in the long run, depending on which further steps can be implemented forbetter control of wastes. The first plant for recycling C&DW was constructed in Auckland (2015) the budget for the recycling plant was funded by the landfills tax obtained (Anthony,2015).

A. NORTH AMERICA

U.S. produces more than 500 million tons of C&DW every year. In 2012, 70% of waste generated had been recycled. This recycling had saved energy identical to 85 million barrels ofoil and proved recycling of C&DW to be highly potential during its lifetime. **(Jin and Chen ,2015)** suggested 77% of concrete used for road 'base/backfill' are recycled and only 23% of concrete used for this purpose is fresh concrete. Canada produces more than 9 million tons and the recovery rate of 7% **(Statistics Canada, 2015c).** Even though hazardous materials have been banned in the recent years, these materials could possibly be present in old buildings, hence in the case of the US a proper system for monitoring C&DW needs to be developed before it is too late.

B. SOUTH AMERICA

In South America, Brazil has segregated the C&DW into various categories and has denoted them with the help ofalphabets A,B,C and D out of which A constitutes the highest portion of the waste, that is about 90% and includes materials such as mortar, remains

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of bricks, concrete and excavated soil Class B has other recyclable and reusable waste which contains plastic, rubber, metal, wood etc. placed in it. Class C has materials that cannot be recycled or reused whereas Class D contains materials which are hazardous in nature. 60% of the C&DW produced here is due to the renovation and demolition activities. It has been estimated that in Brazil, the C&DW generated is more than 70 million tons per year. The recovery rate here is marginal though the government has implemented new laws to promote waste recycling. Mexico has also classified C&DW the same way as it has been done in Brazil but into three categories. Category A includes concrete, mortar and related by products, while category B comprises of materials dug out of the ground and category C includes other materials such as wood, plastic, glass, metal etc. Apart from categorizing materials in Mexico, materials in category A should recycle at least 30% and this rate of recycling increases at a margin of 15% every year such that it reaches is 100% (Garcia et al., 2012). In Mexico, the C&DW produced is far lower with respect to Brazil and it is approximately 12 million tons per year (Aguilar-Penagos et al., 2017).

D. Europe

In 2013, around 35 million tons of C&DW was generated IN Austria, however 76.4% were derived from the excavation of soil and stones (Deloitte, 2015a). Austria has contributed 1455 million USD to the country's economy and generated 14779 jobs by implementing proper waste management measures (Mayr, 2014).In 2013 up to 87% of C&DW was recycled here(Deloitte, 2015a). Cyprus having a population of 1.1 million people in 2012 generated 2.09 million tons of waste (Eurostat, 2012). The C&DW out of the total waste was only 6.8% and 59% of this waste was recovered and 38% of this waste was disposed in landfills (Deloitte, 2015c). 'Waste law' regulates the waste recycling in this country. Estonia produces nearly 2 million tons of C&DW (Routelmann, 2015) with a recycling rate of nearly 95% in 2013.The C&DW produced in the Czech Republic accounts for 46% of the total waste produced and there is a recovery rate of 95% here (Ministry of Environment, 2014). In Denmark, the concrete waste contributes to more that 5 million tons of C&DW and the recycling rate here is reasonably high. Road construction uses most of the recycled material generated (Deloitte, 2015d). 20% of the total waste produced in Croatia comprised of C&DW. Though there have been many measures like 'The Construction Act', 'The Waste Act', 'The Waste Management Strategy' (Bjegovic, 2008), insufficient funds and lack of awareness has resulted in hindrance for recycling (Marinkovic et al, 2008)

E. Africa

The C&DW generated in South Africa is more than 21 million tons and constitutes a sizeable portion of the country's total generated waste (Van Wyk, 2014). Majority of C&DW comprises of concrete (23%) and wood (27%). In South Africa, recycling of C&DW has an immense potential, that recycling only 30% of the waste in Cape town added up to 0.1 million USD to the city's economy (Green Cape, 2015).

The legislation in this region are just developing and hence this country has a low recycling rate and capacity, and this is predicted to grow with the development of the country. Nigeria, producing more that 15 million tons of C&DW and concrete contributes to a major portion of the waste in this region (Otoko, 2014). In Nigeria, due to insufficient reuse and recycling strategies most of the waste generated here are dumped in landfills.

F. Asia

In 2013 India produced about 530 million tons of waste placing itself as the 2nd highest C&DW producer in the world. Even in such a condition, Indian standards permit for the use of recycled aggregate in concrete has not been granted according to IS 383 (1970) and only materials that are sourced naturally are encouraged (Centre for Science and Environment India, 2014). Estimation of C&DW has a limited focus in this region and in fact the potential of C&DW is often ignored here. The government here should consider bringing in further initiatives so that the use of recycled materials can be encouraged thereby preventing the disposal of massive quantities of C&DW into landfills. According to the estimates in 2012 China is the largest producer of C&DW in the world and this is more than1 billion tons and up to 1.13 billion tons in 2014 (Lu, 2014). The rapid growth of infrastructure and financial hub for many companies that are growing fast and is possibly one of the main reasons for the generation of C&DW to be so high. A major portion of the C&DW is contributed from excavated material(Lu, 2014). Around 75 million tons of waste

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from C&D activities was generated in Japan in 2011 which is comparatively lower than the data of previous years compared to 95 million tons in 2001 (Nakajima and Futaki, 2002). Despite the lower population and area with respect to Japan, South Korea which is a neighboring country of Japan, produced 68 million tons with a recycling rate of 98 % (Yang et al, 2015). This can be credited to the ministry of environment for constantly regulating and issuing policies regarding the use of RA and the recycling of construction wastes.

G. General Analysis Of The Construction Waste Problems In Dubai

A rapidly growing city like Dubai has an urban growth of about 3.9% every year. This notable growth has contributed to a lot of CO2 emissions and wase production and this has also alerted the social, environmental, and financial issues. C&DW has resulted to about 75% of the total waste generated (U.A.E Interact, 2007) and U.A.E is one of the world's leading C&DW producers (Al-Hajj and Hamani, 2011). Because of extensive activities in the construction sector and the increasing requirement for construction materials, U.A.E has one of the greatest rates of CO2 emission as per the World Bank report. Recent studies on CO2 emissions in the country states that, Portland cement manufacturing cement factories contributed to a huge share in C02 emissions. Immediate decisions were taken by H.H. Sheikh Mohammed bin Rashid Al Maktoum to implement further environmental policies on cement industries , new permits certifying the fulfilment have to be obtained by all new cement factories of the new requirements to reduce the CO2 emissions down to the acceptable limit (Al Bayan, 2011). Based on the studies carried out by a researcher named Abu Shaban in 2015, for replacing the use of PC with an eco-friendly cementitious material with better strength, green concrete came out to be a better solution. These studies convinced the DM that green concrete can be an innovative idea for a sustainable city, and this was also approved by different local authorities, which resulted in making green concrete mandatory for every project. In this way, it was clearly proved that legislation can be a clever way to enhance sustainable developments and practices. It can be concluded that, there has been a major impact on the environment of U.A.E as result of mainly two problems, that is C02 emissions and C&D waste. The second problem being C&D waste, has only been addressed and still the approach to it remains theoretical, a driving force is required to bring about a proper solution to this problem.

DISCUSSION

The research approaches are classified into three methods to enable a direct a research from its wider inception to a narrower and deeper demonstration, the three methods used are: Literature analysis, qualitative and mixed approach method. The Literature Analysis Method uses the support from existing journals, government portals, and websites to review the C&DW management strategies worldwide, the history of C&DW management worldwide and relates it to issues in relation with U.A.E. For this project, the qualitative approach is carried with the help of questionnaires which were shared to professionals who were a part of the construction sector. The data obtained from the survey obtained from around 125 participants was represented graphically and analyzed in order to conclude the research by gathering the necessary proofs and evidence. The Mixed Approach method helped in inter-relating the findings of the other two methods i.e., The Qualitative Research method and The Literature Analysis methods to make an appropriate conclusion to the paper as a whole. Usually, this method can produce better results since it can be considered as a middle point between the qualitative and literature analysis method as this method analyzes the numerical and wording data that is collected to reconfirm the data collected. This project using data from various countries of six continents has roughly assessed the C&DW generation and measures taken by these countries to tackle this issue. The following is a summary of the survey:

- 70% of responses were aware of the effect of the construction industry on the environment.
- 52.8% of responses considered environmental and green-building principals were considered as main drivers for project design and execution.
- 58.4% of responses believe that green-building principals have minor impact on budget compared to long term benefits

84.8% of responses agreed that minimizing of waste must be adopted in the whole project cycle •72% of responses say that the recycling of concrete is not quite common.

- 32% of responses only say that they implement waste

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management plans

• 30% of responses are not aware of the waste quantity generated on site.

• 68.55% of responses say that better design, better DM rules and better practice at site must be implemented together to minimize construction waste.

• 52.42% of responses say that money, time and technical difficulty are the reasons for difficulty in segregating waste.

• 55.29% of responses are aware of financial benefits of selling construction waste.

Literature analysis stated numerous government policies in different parts of the world which could be summarized as legislative acts and measures that includes implementing tax for the use of landfills. It also discussed the reasons the existing measures in U.A.E for dealing with C&DW materials and very few measures taken to deal with this problem and existing measures are not implemented well. Hence it could be suggested that more legislative measures including rewards and punishments(taxes for landfills) could be effective in promoting the reuse and recycle of construction and demolition waste.

CONCLUSION

It has been observed that proper measures from the governments of various countries including rewards for implementation of proper C&DW as well as taxes for using landfills have led to a significant increase in a proper C&DW management. The survey carried out in the carried out by this study bought to light the interest and positive attitude of the construction industry professionals in implementing C&DW control and recycling, which encourage further studies and research to improve the industry as whole and the C&D waste management as part. A very interesting observation was the suggestion by the professionals on the idea of partnering in taking up the responsibilities of the C&DW generated, the partnership can be between stakeholders and recycling plants or respective authorities, this can possibly be very effective in the future of the construction industry. Furthermore, if the existing methods that have been researched can be more effectively applied to the scenario in U.A.E, it could possibly be highly effective in bringing a significant advantage to the sustainable development in the U.A.E. The following factors can be held responsible for the lack of C&DW management policies in the U.A.E:

• The unavailability of a real driving force to implement better practices is one of the major reasons for the generation of C&DW.

• The awareness level among most of the decision makers and professionals are high in regard to the importance of effective waste management behaviors at construction sites, the professionals also displayed a supporting attitude to the implementations of eco-friendly behaviors but the lack of legislations with regards to C&DW has been concluded to be the major reason for the absence of proper recycling measures

• Money, time and technical feasibility must be made available for better control of C&DW.

From this study, it can be concluded that the current measures in U.A.E can be enforced to facilitate an efficient C&DW management in the country. Landfill taxes and proper policies similar to that of other countries which will ensure and promote the reuse of C&DW material as well as the use of Recycled aggregate can also be implemented in the U.A.E so that a larger proportion of C&DW generated can be diverted from landfills and incinerators.

ANNEXURE

This Annexure includes the questions that were included in the survey that was conducted as a part of this project.

1)Construction industry having the major negative effect on the environment.

a) Strongly agree. b) Agree. c) I don't know. d) Disagree e) Strongly disagree.

2)The environmental issues and green-building principals considered being one of the main drivers for the project design and execution.

a) Strongly agree. b) Agree. c) I don't know. d) Disagree e) Strongly disagree.

3)The current DM's green-building regulations like thermal insulation and green concrete are not enough to save the environment, and more rules must be applied like waste recycling plans to improve the current status.

a) Strongly agree. b) Agree. c) I don't know. d) Disagree e) Strongly disagree.

4)The implementation of green-building regulations has a minor impact on the project budget compared to the benefits on longer terms.

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a) Strongly agree. b) Agree. c) I don't know. d) Disagree e) Strongly disagree.

5) Minimizing waste techniques must be adopted in whole project life cycle starting from the design stages up to the demolition.

a) Strongly agree. b) Agree. c) I don't know. d) Disagree e) Strongly disagree.

6) Contractors have less knowledge about the importance of waste segregation at site and which element can affect the recycling process.

a) Strongly agree. b) Agree. c) I don't know. d) Disagree e) Strongly disagree.

7) Its common practice to recycle steel, timber, plastic, and glass waste, but it's not being practiced or known it's applicable for concrete waste as well.

a) Strongly agree. b) Agree. c) I don't know. d) Disagree e) Strongly disagree.

8) In your current project do you have a waste management plan.

a) Yes, it's applied efficiently. b) Yes, but it's not applicable.

c) Yes, but its costly to apply. d) No, it's not important. d) I don't know.

9) What is the approximate waste quantity generated monthly at your site?

a) 5ton or less. b) 15ton. c) 25ton. d) 50ton or more. e) I don't know.

10) Which element do you think can minimize the construction waste generation?

a) Better designs. b) Better practice at site. c) DM rules. d) All the previous. e) Construction waste can't be minimized due to workloads.

11) What is the reason behind mixing all different types of waste together at sites?

a) We have no problem; we segregate our waste. b) Money and time consuming to segregate. c) Its technically difficult to segregate. d) Both answers in 2&3. e) It's not important.

12) Selling project construction waste can return financial profit to the contractor.

a) Strongly agree. b) Agree. c) I don't know. d) Disagree e) Strongly disagree.

13) Do you think concrete waste can be also sold?

1) Strongly agree 2) agree 3) I don't know 4) disagree 5) strongly disagree

14) Which driver will encourage the contractors to apply the waste segregation and will increase the recycling rate of concrete waste?

1) Rewards 2) awareness 3) rules and penalties 4) all in 1,2 and 3 5) I don't know

15) Do you think that sharing ideas with contractors at the project inception stage may help in waste minimizing and to improve the waste recycling rate?

1) Strongly agree 2) agree 3) I don't know 4) disagree 5) strongly disagree

16) If we apply the concrete waste recycling, in your opinion under which responsibility will be the initial cost of concrete waste segregation, transportation and recycling?

1) The contractor 2) The client 3) recycling plant 4) shared between all 5) I don't know

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Plastic Recycling For 3d Printing Material

Alwin anto[1], Amal ramankutty[2], Amalgosh vinayan[3],

Ameen muhammed[4], Nithin rajan[5]

[1,2,3,4] PG Scholar, Department of Mechanical Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala

[5] Assistant Professor, Department of Mechanical Engineering, IES College of Engineering, Chittilappilly, Thrissur, Kerala

Abstract –Abstract - Pervious concrete which is also known as the no- fines, porous, gap-graded, and permeable concrete and Enhance porosity. Concrete have been found to be a reliable storm water management tool. The main objective of this study is to increase the compressive strength of pervious concrete to make it use for medium traffic volume roads. Another objective is to control the storm water runoff at the surface of the pavement, to increase ground water level and for safe disposal of industrial waste like fly ash and agricultural waste like rice husk. Also it helps to improve water quality by filtering pollutants in the sub strata. It is fast draining concrete pavement and a solution for controlling storm water runoff in streets, parking surface, driveways and walk ways. It can be used for interlocking and in sports courts. Compressive strength is increased by adding fly ash and rice husk ash but further adding decreases when it reaches a certain limit due to weakening of cement bonding. Only a certain percentage of fly ash gives high compressive strength. Greater compressive strength obtained when 10% of cement is replaced by rice husk or fly ash. Another advantage of using this fly ash and rice husk ash is that it reduces the amount of waste generated from industrial and agricultural field and also enhances the ground water recharge and also it is an effective solution for storm water runoff.

Keywords- pervious concrete,storm water runoff

I. INTRODUCTION

Pervious concrete which is also known as the no-fines, porous, gap-graded, and permeable concrete and Enhance porosity concrete have been found to be a reliable storm water management tool. By definition, pervious concrete is a mixture of gravel or granite stone, cement, water, little to no sand (fine aggregate). When pervious concrete is used for paving, the open cell structures allow storm water to filter through the pavement and into the underlying soils. In other words, pervious concrete helps in protecting the surface of the pavement and its environment. Pervious concrete is also a unique and effective means to address important environmental issues and sustainable growth. When it rains, pervious concrete automatically acts as a drainage system, thereby putting water back where it belongs. Pervious concrete is rough texture day, and has a honeycombed surface, with moderate amount of surface ravelling which occurs on heavily travelled roadways. Carefully controlled amount of water and cementitious materials are used to create a paste. The paste then forms a thick coating around aggregate particles, to prevent the flowing off of the paste during mixing and placing. Using enough paste to coat the particles maintain a system of interconnected voids which allow water and air to pass through. The lack of sand in pervious concrete results in a very harsh mix that negatively affects mixing, delivery and placement. Also, due to the high void content, pervious concrete is light in weight (about 1600 to 2000 kg/m3). Pervious concrete void structure provides pollutant captures which also add significant structural strength as well. It alsoresults in a very high permeable concrete that drains quickly

II. MATERIALS

A) Cement

In this project work, we have used Ordinary Portland Cement (OPC) of grade 53. It is a higher strength cement to meet the needs of the consumer for higher strength concrete. As per BIS requirements the minimum 28 days compressive strength of 53 Grade OPC should not be less than 53 MPa. For certain

specialized works, such as pre stressed concrete and certain items of precast concrete requiring consistently high strength concrete, the use of 53 grade OPC is found very useful. 53 grade OPC produces higher-grade concrete at very economical cement content. In concrete mix design, for concrete M-20 and above grades a saving of 8 to 10 % of cement may be achieved with the use of 53 grade OPC.

Fig 2.1: Cement

A) Coarse Aggregate

Here we are using coarse aggregate only for pervious concrete. Coarse aggregate was used as a primary ingredient in making the permeable concrete. Larger aggregates provide a rougher surface. Recent uses for pervious concrete have focused on parking lots, low- traffic pavements, and pedestrian walkways. In those situations if they are not easily available, suitable rock types are crushed to the desired particle sizes for making coarse aggregate. Here we used aggregates of size 20 mm

Fig 2.2: Coarse aggregate

B) Fly ash

Fly ash, also known as "pulverized fuel ash", is one of the coal combustion products, composed of the fine particles that are driven out of the boiler with the flue gases. Ash that falls in the bottom of the boiler is called bottom ash. In modern coal fired power plants, fly ash is generally captured by electrostatic precipitators or other particle filtration equipment before the flue gases reach the chimneys. Together with bottom ash removed from the bottom of the boiler, it is known as coal ash. Depending upon the source and makeup of the coal being burned, the components of fly ash vary considerably, but all fly ash includes substantial amounts of silicon dioxide (SiO_2) (both amorphous and crystalline), aluminium oxide (Al_2O_3) and calcium oxide (CaO), the main mineral compounds in coal-bearing rock strata.

Fig 2.3: Fly ash

A) Rice Husk Ash:

Rice husk Ash (RHA) can be also used as a supplementary cementitious material which helps for imparting strength to the pervious concrete. It is cheaply available and formed by the burning of rice husk which is an agricultural waste. Rice husk ash is used in concrete construction as an alternative of cement. The rice paddy milling industries give the by-product rice husk. Due to the increasing rate of environmental pollution and the consideration of sustainability factor have made the idea of utilizing rice husk. To have a proper idea on the performance of rice husk in concrete, a detailed study on its properties must be done. The rice husk ashes in the concrete react with the calcium hydroxide to bring more hydration products. The consumption of calcium hydroxide will enable lesser reactivity of chemicals from the external environment.

Fig 2.4: Rice husk ash

III. EXPERIMENTAL PROGRAMME

A) Mixing

Mix the cement and fine aggregate on a water tight none-absorbent platform until the mixture is thoroughly blended and

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is of uniform colour and add the coarse aggregate and mix with cement and fine aggregate until the coarse aggregate is uniformly distributed throughout the batch. Add water and mix it until the concrete appears to be homogeneous and of the desired consistency

Fig 3.1: Mixing

Fig 3.2 Compressive Strength Test

A) Sampling

Clean the mounds and apply grease.Fill the concrete in the moulds in 3 equal layers.Compact each layer with not less than 35strokes per layer using a tamping rod (steel bar 16mm diameter and 60cm long, bullet pointed at lower end). Level the top surface and smoothen it with a trowel

B) Curing

The test specimens are stored in moist air for 24hours and after this period the specimens are marked and removed from the moulds and kept submerged in clear fresh water until taken out prior to test

C) Procedure for Compressive strength test

Remove the specimen from water after specified curing time and wipe out excess water from the surface. Take the dimension of the specimen to the nearest 0.2m.Clean the bearing surface of the testing machine. Place the specimen in the machine in such a manner that the load shall be applied to the opposite sides of the cube cast. Align the specimen centrally on the base plate of the machine. Rotate the movable portion gently by hand so that it touches the top surface of the specimen. Apply the load gradually without shock and continuously at the rate of 140kg/cm2/minute till the specimen fails. Record the maximum load and note any unusual features in the type of failure

IV. RESULT AND DISCUSSION

1) Compressive strength after 7 days

a) Specimen with fly Ash as SCM

Table 4.1 Compressive strength after 7 days of specimen with fly ash

Sl. No	% of replacement of cent by fly ash	Compressive strength (N/mm^2)
1	0	12.2
2	10	15.5
3	20	14.8
4	30	9.5

b) Specimen with Rice husk ash as SCM

Table 4.2 Compressive strength after 7 days of specimen with RHA

Sl. No	% of replacement of cent by fly ash	Compressive strength (N/mm^2)
1	0	12.2
2	10	17.8
3	20	15.2
4	30	10.2

V. CONCLUSION

From the experimental results of investigation, the following conclusions can be made. Pervious concrete allows water to pass through it. It is usually not composed of fine aggregate. It helps for effective use of waste products and making it an eco-friendly concrete. the compressive strength after 7 days and 14 days for different percentage of fly ash and rice husk ash. Compressive strength is increased by adding fly ash and rice husk ash but further adding decreases when it reaches a certain

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limit due to weakening of cement bonding. Only a certain percentage of flyash gives high compressive strength. Here, we got greater compressive strength when 10% of cement is replaced by rice husk or fly ash. If there percentage is increased, then the compressive strength is decreasing. Therefore, it is concluded that the compressive strength of pervious concrete will not get further increased until a certain value of fly ash or rice husk is added in the concrete. Another advantage of using this fly ash and rice husk ash is that it reduces the amount of waste generated from industrial and agricultural field and also enhances the ground water recharge and also it is an effective solution for storm water run off.

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SMART SECURE BUS MANAGEMENT SYSTEM (SSBMS)

Jaimy Johnson[1], Sonu Sarath[2], Mohamed Jaseel[3],

Thomas Chacko[4], Shemitha P [5]

[1,2,3] PG Scholar, PG Scholar, Department of Computer Science and Engineering, IES College of Engineering Chittilappilly, Thrissur, Kerala

[4 5] Assistant Professor, Department of Computer Science and Engineering, IES College of Engineering Chittilappilly, Thrissur, Kerala

ABSTRACT-The development of semi autonomou sintimationsystemtoparentsaboutthepresenceoftheir child in school or college campus is the objectiveof thisProject. If a student bunked his/her class orabducted from school or college, their parents mightknow that after 6pm only. Here we proposed a newsolution to send quick intimation to their parents aboutthe presence of students through school or college busat 9.30am. By this we can track the children and savethemearly if any mischief ishappening. For this weareusinganRFIDreader,GPStrackerandGSMmodulealong withanArduinomega2560anditssoftware. RFID readers can read the RFID tags of thestudents. GSM system is used to send their presence totheir parents through SMS. To achieve this, a passiveor active tracking devicewith GPS is used. PassivedevicesstoreGPS location,speedandtime. Once the vehicle returns toa predestined point, thedeviceisremovedandthedatadownloadedtoacomputer for evaluation. By this we can get arrival anddeparture locations of the students. Active devices alsocollect the same information, but usually transmit thedata in near-real-time via cellular or satellite networkstoacomputerordatacenterforevaluation.Itisusedto track the location of a vehicle from organizing itself.Thiselectronicdocumentisa"live"templateandalready definesthecomponents of your paper [title,text,heads,etc.]initsstylesheet.

I. INTRODUCTION

The travel of students from home to school and back hasalways been a source of concern for parents. Studentsoften get on the wrong school bus and get off at thewrong stops. Bus drivers may not be able to identify allthe students and will not know in time if a students ismissing while some schools have already implementedGPStracking of buses using GSM and other means,theydonotensureabsolutesafety. Someofthesedevices do not give real time information whereas somearetooexpensivetobeaubiquitoussolution.

Thesystemdescribesalowcostcomprehensiveschoolbusmonitoringdevicethattracks low cost comprehensive school bus monitoringdevice that tracks the location, the speed, the peopleonboard, adherence to route and schedule and otherinformation pertinent to school buses. It gives a quickintimation to parents about two major issues related tochildren and adults. The First issue is abducted. Incriminal law, kidnapping or abducting is the takingawayortransportationofapersonagainstthatperson'swill.Asof2007,thetitle"Kidnappingcapital of the World" belongs to Iraq with possibly1,500foreignerskidnapped.In2004,MexicoandIndia got first and third positions respectively. Thesecondissueisbunkingoffschool orcollege.StatisticspublishedbytheDepartment for Education reveal that the truancy rateroseto1.1percentin2010-11.That means, about62,000 youngsters in primary, secondary and

special schools missed sessions without permission onaty specialschoolsmissedsessionswithoutpermissiononatypical day last year, through truancy, family holidays,illnessandotherreasons,ananalysisofthedatasuggests. To reduce these two issues, the proposedsystemisimplemented.

II. RELATEDWORKS

Theexistingsystemprovidesrealtimeinformationofthevehiclelikethelocation, theroute,speed,listof passengers and the adherence of drivers to scheduleand much more. In the existing system there is noimmediatestudentdepartureorarrivalbasednotification system initiated. To know more studentsbased information like route wise student list, there isnodetaileddatabasemaintainedcurrently. Andwecan't be able to notify the student fees pending detailsalert.

Thedevelopmentofasemi-autonomousintimationsystem to parents about the presence of their child inschool or college campus is the objective of this Project.It uses an RFIDreader, GPStrackerand GSMmodulealongwithanArduinomega2560anditssoftware.RFIDreaderscanreadthe RFIDtagsofthestudents.

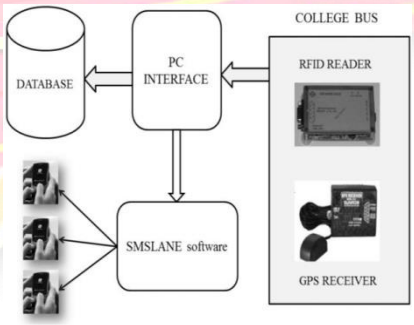
Recently, crime against children is increasing at higherrate and it is high time to offer safety system for thechildren going to school. This paper presents a system toinform parents about the status of their children such asabsence. Thesystemchecksanddetectswhichchildenter the wrong bus and issues an alerttothiseffect.RFID-based detection unit located inside the bus detectstheRFIDtagswornbythechildrenInaddition, thesystemchecksthechildrenabsenceandupdatesthedatabase.

Third application isgeneration of e-buspasssystem which is an eco-friendly as there is no need ofgenerationofplasticbuspasses.Lastapplicationisdeveloping an emergency handling system which willsendalertmessagessimultaneouslytocollege,policeandambulanceincaseofaccidents.

III. PROPOSEDSYSTEM

The Proposed MethodologyincorporatesRFIDreader,GSMandGPSinsideaschool or college bus to give quick intimation to parentsabout the absence of their children. A Radio FrequencyIdentificationtechnology,whichconsistsoftwocomponents, i.e. RFID tags and RFID reader facilitatesautomaticwirelessidentificationusingelectronicpassive and active tags with suitable reader. Here it isusedtorecordthepresenceofthestudents.

GSMsystemisusedtosendtheirpresence to their parents through SMS. Short MessageService is a text messaging service component of phone,webormobilecommunicationsystem.Itusesstandardizedcommunicationprotocolstoallowfixedlineormobilephonedevices toexchangeshorttextmessage.Apassiveoractivetrackingdevicewith GPSis used to hold GPS receiver with an SD card holder.This setup can store GPS location, speed and time. Oncethe vehicle returns to a predestined point, the device isremovedandthedata downloadedtoacomputerforevaluation.Bythiswecangetarrivalanddeparturelocationsofthestudents.Arduinomega2560isconnectedalong withthe GPS.Theproposed systemarchitectureisshowninFig.8



Advantagesofthe proposedsystem

RealtimetrackofschoolbusonSmartphoneBusarrivaltimenotification,delaynotificationTrackcurrent location of bus using mobile or website. Starttime and End time log for each bus Route allocation,optimizedrouteandHistoryplayback.Alertfunctionality based on delay or idle SMS notificationprior to reach your bus stop. Real time attendance fromBus and School Gate Real

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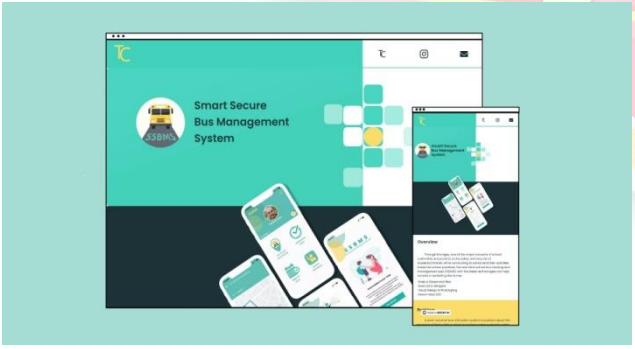
time notification if a studentleaveearlyfromschool.Realtimenotificationontravelingh oursordroppedinwrongplacesNotification options for parents/ School managementbyEmailorSMS.Reportsonattendance.

We developed an app interface to receive real timenotificationstotheparentsaboutthechildwhereabouts assaid above. Also itmust include are otherfunctionalitieslikelivebustracking,reportleaves, checkstudentstatus,&checkthestudentattendancedatathroughou tthewholeacademicyear. Once Ihadaclear idea ofthe implementationarchitecture of the app, I went ahead and created lo-fiwireframesfortheapp. Therewere4mainfunctions. And the app's main interface must focus onthese4functionalities

Visit the website we createdwhich shows the casestudyandfinaldesignoftheapp. (https://ssbms-in-f.questai.app/SSBMSapp/casestudy/)



III.CONCLUSION

In this paper presence of the students were maintainedand intimated to the parents. This is implemented byusing RFIDasa proof oftheir presence, also the statusof the Student information about their presence sends bySMS via Excel to SMS software. By using this if anymischief(i.e.Abducting,bunkingoraccidents)ishappening on the way to school or college can be foundearly.Hereweplantoimplementthisininstitutionvehicle because of providing details about arrival anddeparture place of the students. This information is usedfor accounting purpose also. Byimplementing this atschool entrance, we can intimate the presence of everystudent.TheRFIDReaderreadthegivendataandtransmitting the data to Mobile. With the help of thisproposed model, one can easily monitor data from anyremotelocationviaSMS,thereisnoneedofdirectcontact, internet or any kind of request send by the useras it is push based technique. RFID based smart secureschool bus technology is a feasible for supervising andtracing the child's during their drive to and from school.Alsothespeedcontrol,drinkanddrive,missingchildren's,a ccidentemergencies,inappropriatedrop,panic button andlogistics management playsamajorroletoimprovechildsecurity.

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