

Mechanised Body Mass Index (BMI) Calculator using PIC16F877A

Dr.M.KANNAN¹, K.THARANITHARAN², A.SREEBA³, Y.NANDHINI⁴, T.PAVITHRAKUMAR⁵,
Ms.T.AKILA⁶

¹HOD,ECE- Dept, ^{2,3}Students,ECE Department, ^{4,5}Students,ECE Department, ⁶Assistant Professor,ECE-Dept

ABSTRACT: *The aim of the project is to Calculate the BMI of a particular person. BMI is Body Mass index it is calculated using height and weight of a person. The hardware used in this project is load cell in the weighing machine and a ultrasonic sensor. Ultrasonic sensor is used to measure the height of the person. The weight of the person is calculated in kilograms. And height is calculated in Meters. LCD display is also used to display the result. The weight is measured by load cell the mechanical force is converted in to electrical signal and transmitted to the microcontroller. The height is measured by ultrasonic sensor the light is reflected when it hits the object and the signal is again transmitted to the microcontroller. And result is displayed using the LCD display. By this way the BMI of the person can be calculated. The main advantage of this device in this generation is to control weight and maintain healthy lifestyle.*

Keywords: *load cell to measure weight, ultrasonic sensor to measure height, healthy lifestyle and BMI calculator.*

1.INTRODUCTION

In the calculation of the BMI machine there are two parameters used height and the weight. It calculates the fat content in the body. BMI machine gives only approximate values. Even though the BMI is used to measure the fat content of the body than the other fat measurement techniques. For children and adolescents aged 2–19 y, the performance of BMI-for-age is better than that of RI-for-age in predicting underweight and overweight but is similar to that of weight-for-height. Body composition was measured by body density, body water and body potassium in a series of 104 female and 24 male subjects aged 14-60 years. Other measurements such as waist circumference and skin thickness can be collected to indicate a person's weight status or body fatness. None of these is as widely used as BMI.

A. Usage

BMI is only an approximation for determining potential weight problems but it cannot be used as a diagnostic tool. A person will be on a great risk if they have a high BMI. Through these measurements physician can recommend different health risk related to weight. For example Skin fold measurements, fitness of a person, nutritionist can decide the diet of a person, and other screening of person's health.

B. Calculation of BMI

The calculation of BMI can be calculated with the help of given standard formula. $BMI = [(Weight \text{ in Kilograms} / (Height \text{ in Meters} \times Height \text{ in Meters})]$

C. Health Consequences of Overweight and Obesity

Overweight and obese individuals are at increased risk for many diseases and health conditions, including the, high blood pressure, high LDL cholesterol and low HDL cholesterol, diabetes, plaque in arteries of heart, heart Stroke, gallbladder infection, degenerative joint disease, respiratory problems, and breast cancer.

2.CONCEPT OF BMI

It is not a new concept to calculate BMI by using a formula, in 19th century; Quetelet Index of Obesity was introduced by a Belgian statistician named Adolph Quetelet. According to his index, BMI is calculated by dividing weight of a person in kilogram by square of their height in inches. Before 1980, physicians were generally using tables for weight and height estimations and they were different for men and women with incorporated ranges of body weights for height in inches. But these tables were imperfect as it relied on weight only, not on the body composition. Currently there is so much advancement in the BMI calculation like the height and weight is calculated automatically with the help of formula and the data is then automatically fed in the computer which shows the BMI of the

person on the monitor screen or on LCD display.

3.DESIGN METHODOLOGY

The weight of the person is calculated through the load cell or a digital weighing machine. The height of the person is calculated by the ultrasound sensor. There is an ultrasound sensor which both transmits and receives ultrasounds. First it emits ultrasounds, and when they strike any object or person in its proximity, they are reflected back after striking it, which is sensed by the sensor again. The height is actually calculated by multiplying the 'speed of the ultrasounds and the time taken by the ultrasounds to return back to the sensor. The data received from the ultrasound sensor and the load cell is then sent to the microcontroller where calculations take place and then the result is sent to the display devices.

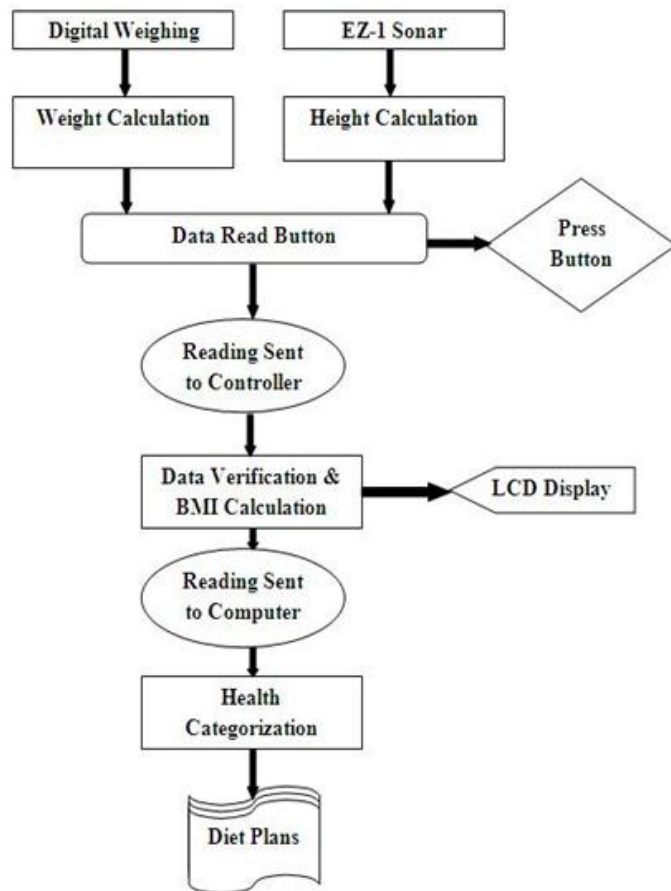


Fig 1. Flow chart of Automated body mass index calculator

A. Project Design

The design of the project is shown in figure 1 in the form of flow chart.

B. Main Features

BMI machine is a modern, elegant, and importantly an

accurate electro medical device that will measure one's height and weight in just a matter of minute. Its main features are as, measuring of height and weight, Calculates body mass index, displays the output on the LCD screen, easy to operate with minimum user interactions, accurate results.

C. Applications in Biomedical Engineering

The automatic Body mass index calculator has many applications in the vast field of biomedical engineering.

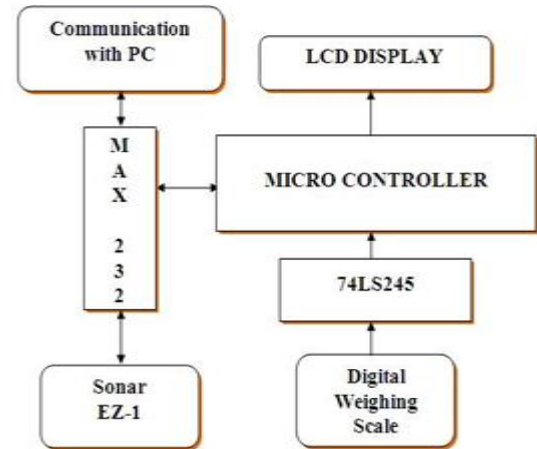


Fig 2. Block diagram of BMI circuit

The field of medicine. The electronic BMI is such a device which is used in Hospitals, Clinics, and even Pharmacies. It can be placed at Gyms, Airports, Hotels, Bus Stands and other social places as well. Obesity as we all know is the leading cause of death nowadays, either directly or indirectly. It can also be used for commercial purposes by installing a fool proof coin acceptor system.

D. Construction of the Project

The figure 2 and figure 3 shows the construction of the project in the form of block diagram and the circuit board of the BMI calculator unit respectively.

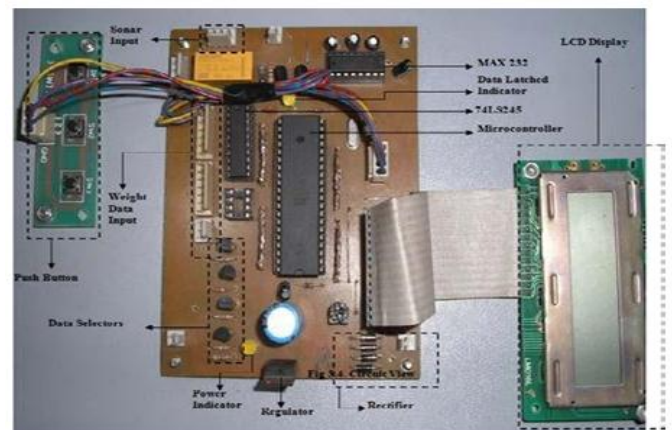


Fig 3. Circuit View of BMI Calculator Controlling Unit

4. RESULTS

For children aged 2–19 y, BMI-for-age was significantly better than were weight-for-height and RI for-age in detecting overweight when average skinfold thicknesses were used as the standard, but no differences were found in detecting underweight. When percentage body fat or total fat mass was used as the standard, BMI-for-age was significantly better than was RI for-age in detecting overweight in children aged 3–19 y. No differences were found between BMI-for-age and weight-for-height in detecting overweight or underweight.

5. CONCLUSION

The conclusion of the project is to calculate the BMI of a person and help to maintain the healthy lifestyle. And it indicates the serious health diseases. Many studies said that BMI machine is a health indicator. We came to know about the electronic principles and gained knowledge about the microcontroller. For children and adolescents aged 2–19 y, the performance of BMI-for-age is better than that of RI-for-age in predicting underweight and overweight but is similar to that of weight-for-height.

REFERENCES

- [1] Mei Z, Grummer-Strawn LM, Pietrobelli A, Goulding A, Goran MI, Dietz WH. Validity of body mass index compared with other body-composition screening
- [2] indexes for the assessment of body fatness. *American Journal of Clinical Nutrition* 2002; 7:597–985.
- [3] Garrow JS and Webster J. Quetelet's index (W/H²) as a measure of fatness. *International Journal of Obesity* 1985; 9:147–153.
- [4] BMI Formula: An Overview, Using the Metric System. Written by/reviewed by: Arthur Schoenstadt, MD
- [5] Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults.
- [6] Michael Snyder, M.D. (2010). *A Life without Dieting*. Hay House.
- [7] Measurement of Body Mass Index (BMI) using PIC 18F452 Microcontroller by Ms. Dipika S. Varma, Ms. Varsha R. Mhatre, Mr. Prashant, M. More, Prof. S. S. Ayane
- [8] Use Of body mass index of adults in assessing individual and community nutritional status K.V. Bailey & A. Ferro-Luzzi
- [9] Examining the Validity of the Body Mass Index Cut-Off

Score for Obesity of Different Ethni by Liette B. Ocker, Assistant Professor, Texas A&M University-Corpus Christi, Don R. Melrose, Associate Professor, Texas A&M University-Corpus Christi

[10] Body Mass Index As A Measure Of Obesity, June 2009, NHS.