LabVIEW interfacing techniques to access webcam

N. Anju Latha[1], B. Rama Murthy[2]

[1][2] Department of Instrumentation, Sri Krishnadevaraya University,

Anantapur, A.P., INDIA

Abstract: A camera is an optical instrument for recording images. A webcam is a video camera that feeds or streams its image in real time to or through a computer to computer network. in telemedicine, communication usually involves with audio and often text as well as video. At its simplest, videoconference provides transmission of static images and text between two locations between patient and healthcare provider. At its most sophisticated, it provides transmission of full-motion video images and high-quality audio between multiple locations. In present work we capture images using LabVIEW program with IMAQdx for webcam accessing. NI-IMAQdx has the ability to use GigE Vision cameras and IEEE 1394 industrial digital video cameras to acquire images. The NI-IMAQdx with application programming interface (API) function support snap, grab, sequence, and triggered acquisitions. LabVIEW has provided with communication tools including ActiveX, TCP, UDP and data sockets for accessing webcam remotely using internet protocols.

Keywords: LabVIEW, IMAQdx, Snap, Grab, Acquisitions, Virtual Instrumentation

INTRODUCTION

A **camera** is an optical instrument for recording images, which may be stored locally or transmitted to another location, or both. The images may be individual photographs or sequences of images constituting videos/movies. Digital cameras use an electronic image sensor, usually a charge coupled device (CCD) or a CMOS sensor to capture images which can be transferred or stored in a memory of the camera for later playback or processing. A **webcam** is a video camera that feeds or streams its image in real time to or through a computer to computer network. When "captured" by the computer, the video stream may be saved, viewed or sent on to other networks via systems such as the internet, and email as an attachment. When sent to a remote location, the video stream may be viewed and save there. A webcam is connected by a USB cable.

The most popular use of webcams is the establishment of video links, permitting computers to act as videophones or videoconference stations. Other popular uses include security surveillance, computer vision, video broadcasting, and for recording social videos. The video streams provided by webcams can be used for a number of purposes. Some of the applications of webcam are video monitoring in child care centers, offices, shops, private areas to monitor security and general activity. In video calling and videoconference webcam can be added to instant messaging and one to one video communication over the internet. Patient tele-monitoring is remotely monitoring the vital parameters of patient with video and providing them to the doctor at remote location than the patient thus ensuring mobility of both patient and the doctor.

In present work, Logitech C920 webcam of Full HD 1080p with 1920 x 1080 pixels resolution is used for Video and photo capture with Face tracking and Motion detection with built-in dual stereo mics with automatic noise reduction

LabVIEW [3], as a programming language, is a powerful tool that can be used to help achieve these goals. LabVIEW (Laboratory Virtual Instrument Engineering Workbench) is a graphically-based programming language developed by National Instruments. Its graphical nature makes it ideal for test and measurement, automation, instrument control, data acquisition, and data analysis applications. Lab VIEW provides a platform to develop test and measurement, date

acquisition, instrument control, date logging, measurement analysis and report generation applications. This results in significant productivity improvements over conventional programming languages.

a Virtual Instrument (VI) is a LabVIEW programming element. A VI consists of a front panel, block diagram, and an icon that represents the program. The front panel is used to display controls and indicators for the user, and the block diagram contains the code for the VI. The icon, which is a visual representation of the VI, has connectors for program inputs and outputs.

LabVIEW uses the VI as programming elements. The front panel of a VI handles the function inputs and outputs, and the code diagram performs the work of the VI. Multiple VIs can be used to create large applications, have several hundred VIs. A VI may also as the user interface or as a subroutine in an application. User interface elements such as graphs are easily accessed, as drag-and-drop units in LabVIEW.

A virtual instrument consists of an industry standard computer of workstation equipped with powerful application software, cost effective modular hardware such as plug-in boards with appropriate driver software, and the unit under test (UUT) and sensors, all of which work together to perform the function of traditional instruments. Virtual instrument is about redefining what an instrument is and empowering users to build powerful instruments and flexible measurement systems never before possible. Application that incorporates many kinds of I/O, such as data acquisition, motion control, image acquisition, and disturbed I/O. Virtual instruments represent a fundamental shift from traditional hardware-centered instrumentation systems to software-centered systems that exploit the computing power, productivity, display, and connectivity capabilities of popular desktop computers and workstations. Its flexibility, combined with powerful modular hardware solutions, creates the ultimate in user-defined, scalable instrumentation systems. It provides easy interface for the programming. It gives us graphical programming with drag and drop functions and online help.

The image and video was recorded using Vision Acquisition in Labview software. All videos were recorded in color of

range (24-bit RGB) at 30 frames per second (fps) with a pixel resolution of 1920 ×1080. We used the NI Vision library to automatically identify the coordinates of the face location in the frame of the video recording.

The NI-IMAQ, NI-IMAQdx, and NI-IMAQ I/O are drivers of NI Vision Acquisition Software (VAS) for use with different image acquisition devices. Each driver includes a set of LabVIEW VIs which can be used for high-level control of a variety of imaging devices.

The **NI-IMAQ** driver software support only National Instruments hardware and some of the image acquisition devices are

- National Instruments Camera Link Frame Grabbers
- National Instruments Parallel Digital Frame Grabbers
- National Instruments Analog Frame Grabbers
- National Instruments 17xx Smart Cameras

The **NI-IMAQdx** driver software supports the third-party image acquisition devices which uses the following buses and standards

- Gigabit Ethernet Cameras Supporting GigE Vision
- FireWire IEEE 1394 Cameras
- USB 2.0 Cameras Supporting Microsoft DirectShow
- USB 3.0 Cameras Supporting USB3 Vision

The **NI-IMAQ I/O** driver software is a smaller driver API used exclusively to program the National Instruments Vision RIO image acquisition cards including the following cards

- NI PCIe-8255R
- NI PCI-8254R
- NI PCIe-8237R

Acquiring Image and video from USB Webcam using IMAQ driver

Web camera accessing using IMAQ [1] explained in detail with blocks. First we explain the block units used for creating and activating Web Camera to capture an image. A grab is a

continuous, high-speed acquisition of data to a single buffer in host memory. This function performs an acquisition that loops continually on one buffer. We can get a copy of the acquisition buffer by grabbing a copy to a LabVIEW image buffer. We must use two Vis IMAQ USB Grab Setup and IMAQ USB Grab Acquire for a grab acquisition in LabVIEW. IMAQ USB Grab Setup initializes the acquisition and start capturing the image to an internal software buffer. We can use IMAQ USB Grab Acquire multiple times to copy the image currently stored in the internal buffer to a LabVIEW image buffer. After the program finishes copying images, IMAQ USB Close shut down the acquisition. Figure 1 shows a simplified block diagram for using IMAQ USB Grab Setup and IMAQ USB Grab Acquire.
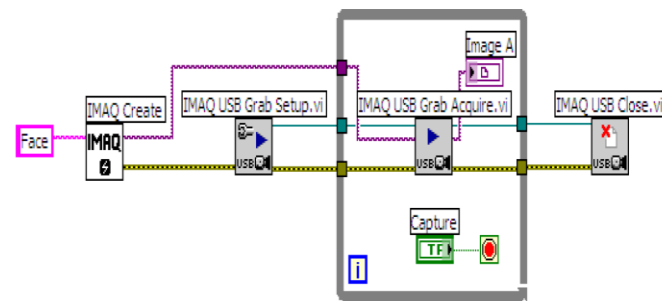

Figure 1: Block Diagram of Capturing Face Images using IMAQ

NI-IMAQ drivers work only with equipment, manufactured by National Instruments Company. Driver NI-IMAQ I/O allows connecting the video capture devices to data acquisition board PCI and PCIe. To connect other USB-cameras NI-IMAQdx driver only suitable to facial video capture.

Acquiring Image and video from USB Webcam using IMAQ driver

The NI-IMAQdx [2] application programming interface (API) function support snap, grab, sequence, and triggered acquisitions. To acquire images first open a camera session. The driver uses a camera session to identify the camera. We can simultaneously open as many cameras which are connected to system. When opening the camera session, first specify camera name and control mode for capturing. Close Camera function is used to close the camera session. In this

project, USB based camera c920 from Logitech is used to capture face images.

Function IMAQdx Open Camera.vi is designed to start the video recording session. If the system had several video cameras, IMAQdx Open Camera.vi function allowed to select the desired to user camera from the list. Property Node specifies the resolution of the recorded image. Property Nodes in LabVIEW are the elements of the block-diagram, which allow controlling programmatically the properties of front panel objects, such as color, visibility, location and numbers format. Function IMAQ AVI Create allow setting the video frame rate and specifying the path to the file. After capturing the image from USB-camera, using the function IMAQdx Grab, it is transferred to the recording function avi-file IMAQ AVI Write Frame. Thus, sharing of functions from IMAQdx and IMAQ AVI palettes allows to construct the compact block-diagram that can play and record video from USB-camera.
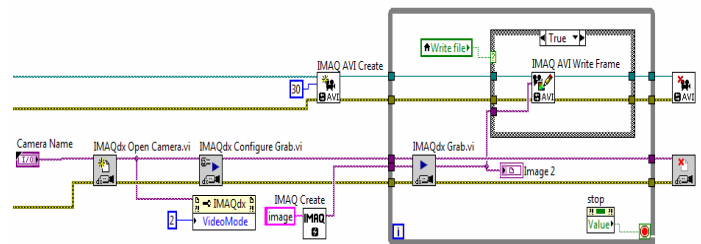

Figure 2: Block Diagram of Capturing Images using

IMAQdx

Snap

The IMAQdx Snap VI used for snap applications. Figure 3 shows a simplified block diagram for using IMAQdx Snap.
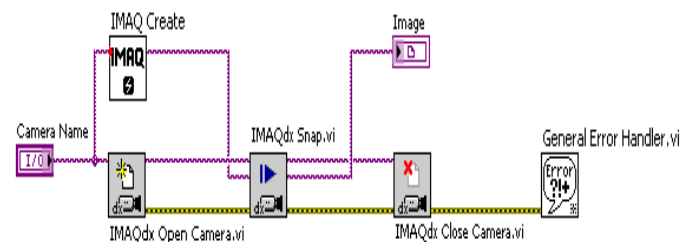

Figure 3: Acquiring an Image Using Snap

Grab

 Two Vis IMAQdx Configure Grab and IMAQdx Grab are used for a grab acquisition in LabVIEW. Call IMAQdx Configure Grab once to open the acquisition and start capturing the image to an internal software buffer. IMAQdx Grab multiple times to copy the image currently stored in the internal buffer to a LabVIEW image buffer. After the program finishes copying images, call IMAQdx Close Camera shut down the acquisition Figure 4 shows a simplified block diagram for using IMAQdx Configure Grab and IMAQdx Grab.
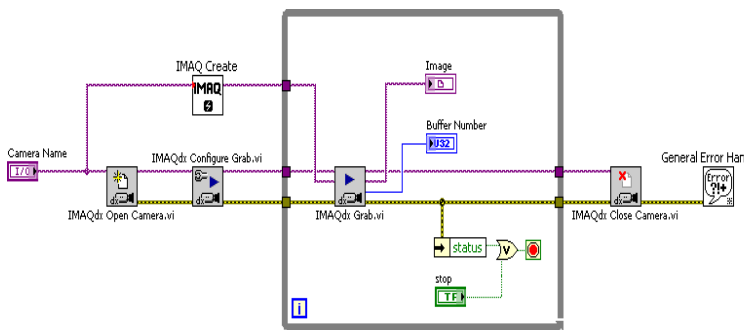

Figure 4. Acquiring Images Using Grab

Sequence

IMAQdx Sequence starts, acquires, and releases a sequence acquisition. IMAQdx Sequence return only after entire sequence is acquired. Figure 5 shows a simplified block diagram for using IMAQdx Sequence. The IMAQ Create VI placed inside a For Loop to create an array of images for the **Image Array In** input to IMAQdx Sequence. The Number to Decimal String VI and Concatenate String VI create a unique name for each image in the array.
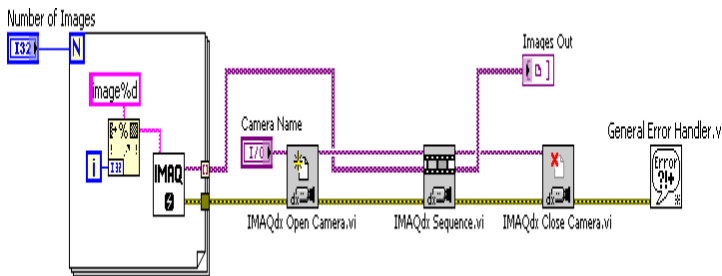

Figure 5. Acquiring Images Using Sequence

A videoconference is a live connection between people in separate locations usually involving audio and often text as well as video. At its simplest, videoconferencing provides transmission of static images and text between two locations and it also provides transmission of full-motion video images and high-quality audio between multiple locations. There is increasing interest in use of videoconferencing technologies in different applications like health care, business, education, and research. All Tele systems involve the use and transmission of information between people at a distance using electronic technology.

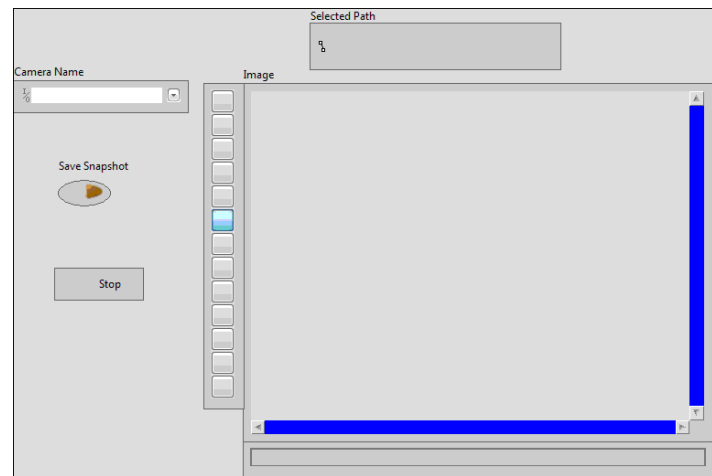The front panel and block diagram of simple capturing image program is shown in figure 6 and figure 7.
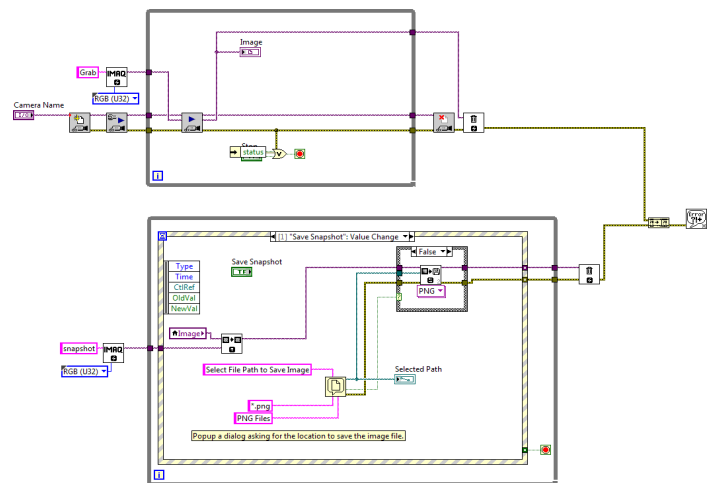

Figure 6: front panel of image capturing .vi

Figure 7: Block diagram of image capturing .vi

Results

The web cam accessing using labview with IMAQ and IMAQdx are explained in above for video conference. It is

simultaneously used in many applications related to videoconference like telemedicine, at childcare center, distance learning centers..Etc. The main advantage of using LabVIEW is it is simple and sophisticated and simultaneously used for further developments by including other usb devices accessing.

References

1. User Guide Ni-Imaq For Usb Cameras, from National Instruments, 2005 National Instruments Corporation. All rights reserved. 371492A-01, JAN05

2. Ni-Imaqdx, Ni-Imaqdx User Manual, *Image Acquisition Software,* September 2006, 371970a-01

3. Gupta Sanjay, Joseph John 'Virtual instrumentation using Lab-VIEW", Electrical Engineering Series, Tata McGraw Hill pub. India, 2006.