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Controlling Of Electronic Equipment Using Gesture Recognition

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***Abstract:** Gesture recognition is a technology which is aimed at interpreting human gestures with the help of mathematical algorithms. In general, consumer electronic equipment use remote control for user interfaces. Replacing the remote control system by means of hand gestures is an innovative user interface that resolves the complications in usage of remote control for domestic appliances. The proposed model deals with using hand gesture to perform the basic controls in electronic equipment like TV and laptop. This type of user interface using gesture has advantages of ease of access and human machine interaction. Gestures are a natural form of communication and are easy to learn. However using gestures to control electronic equipment requires gesture recognition algorithm and adequate hardware relating to it.*

***Keywords** – Gestures, Gesture Control, Gesture recognition, Laptop control, LabVIEW.*

I. INTRODUCTION

LabVIEW is a graphical programming environment used by millions of engineers and scientists to develop sophisticated measurement, test, and control systems. The Sixth Sense prototype implements several applications that demonstrate the usefulness, viability and flexibility of the system. The Sixth Sense device has a huge number of applications.

With the advent of sixth sense technology, it is easier for us to be technologically awake all the time and to connect to the world via the newest inventions. The sixth sense prototype is comprised of equipment like a camera and software to perform image processing. Recognition is made using computer vision technique. The software program, written in LabVIEW, processes this video stream data and interprets the movement of the hand.

For humans, vision is important to identify, classify and recognize things. The same applies to robots as well. These types of machines are called as Vision Controlled Machines (VCM).

Some common applications of VCM are

- Robotics,
- Object recognition & comparison and
- Other industrial applications.

Fig.1. Block Diagram of VCM

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The block diagram of a Vision Controlled Machine is shown in Fig.1. The image acquisition device used here is the camera. The selection of camera is based on the application, cost and processor used.

II. LITERATURE SURVEY

"Single Camera Dedicated Television Control System using Gesture Drawing" (2012). It was implemented on focusing on control functions on TV only. Some gestures were uncomfortable for the users. Dynamic gestures have been used to control a TV. The model did not have facility to for the user to define the gestures [1].

"User performance measures for evaluating interactive TV pointing devices" (2011). This paper suggested the usage of standard mouse 2.0 to replace remote pointing devices. Gyro point showed highest speed for movements on straight trails but it showed it had the highest error rate. Evaluation of curved trail showed insufficient result while using standard mouse 2.0[2].

"A low-cost visual motion data glove as an input device to interpret human hand gestures" (2010). In this paper the visual motion data glove was developed and results for gesture recognition were obtained. A single-channel video system was adapted used to reduce the cost and 3D hand motion estimation algorithm was designed. Although they provide accurate control, wearing additional devices made the users uncomfortable [3].

"Free-hand gestures for music playback: deriving gestures with a user-centred process" (2010). The process proposed to derive and design gesture interface control music playback. The technical limitations affected performance of gesture recognition techniques [4].

"Actual remote control: a universal remote control using hand motions on a virtual menu" (2009). A wrist watch type wearable remote control that runs and interacts with the virtual menu through natural hand motions was developed. With an invisible virtual menu, a user's hand motions can be used in a fast and effective way. Depending on the type of user the performance of the FingerTapButton can lead to erroneous [5].

"The design and evaluation of a flick gesture for 'back' and 'forward' in web browsers" (2003). This paper described the evaluation of a gesture system for navigating the web browser. Time taken to complete the task was reduced by 18%. However training was needed, to make the gesture in a precise manner [6].

"GWindows: robust stereo vision for gesture based control of windows" (2003). For dynamic gesture recognition, many works have used depth information based on stereo vision or 3D camera. However, stereo vision does not provide image resolution sufficient for hand shape analysis due to the lack of texture on the subject [7].

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III. SIXTH SENSE TECHNOLOGY

Steve Mann implemented the Sixth Sense technology as the neck worn projector with a camera system. His work was carried forward by Pranav Mistry, an Indian research assistant in MIT Media Lab. He came up with exciting new applications from this technology. Sixth sense technology was developed at media labs in MIT and coined as Wear Ur World (WUW).

Operation:

This sixth sense technology provides us with the freedom of interacting with the digital world using hand gestures. This technology has a wide application in the field of artificial intelligence. This methodology can aid in synthesis of bots that will be able to interact with humans. This technology enables people to interact in the digital world as if they are interacting in the real world. The Sixth Sense prototype implements several applications that demonstrate the usefulness, viability and flexibility of the system. The sixth sense prototype is comprised of equipment like pocket projector, a mirror, mobile components, color markers and a camera.

The projector projects visual images on a surface. This surface can be wall, table or even your hand. Thus, the entire world is available on your screen now. When user moves their hands to form different movements with colored markers on the finger tips, the camera captures these movements.

Both the projector and the camera are connected to the mobile computing device in the user's pocket. Recognition is made using computer vision technique. These markers act as visual tracking fiducially. The software program processes this video stream data and interprets the movements into gestures.

The gestures are different from one another and are assigned some commands. These gestures can act as input to application which is projected by the projector. The mirror reflects the image formed by the projector to front. The entire hardware is fabricated in the form of a pendent. It works very similar like a touch screen phone with entire world as the screen.

The working of sixth sense technology is described in Fig.2.

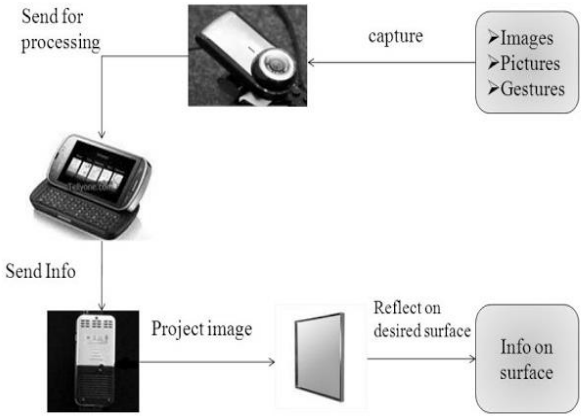

Fig.2. Working of sixth sense technology

IV. GESTURE RECOGNITION

It is a technology which is aimed at interpreting human gestures with the help of mathematical algorithms. Gesture recognition technique basically focuses on the emotion recognition from the face and hand gesture recognition. Gesture recognition technique enables humans to interact with computers in a more direct way without using any external interfacing devices. It can provide a much better alternative to text user interfaces and graphical user interface which requires the need of a keyboard or mouse to interact with the computer. An interface which solely depends on the gestures requires precise hand pose tracking.

In the early versions of gesture recognition process special type of hand gloves which provide information about hand position orientation and flux of the fingers. Neural network approaches or statistical templates are the commonly used techniques used for the recognition purposes. This technique has a high accuracy usually showing accuracy of more than 95%. Time dependent neural network can also be used for real time recognition of the gestures.

Interface with computers using gestures of the human body, typically hand movements. In gesture recognition technology, a camera reads the movements of the human body and communicates the data to a computer that uses the gestures as input to control devices or applications. For example, a person clapping his hands together in front of a camera can produce the sound of cymbals being crashed together when the gesture is fed through a computer.

V. SOFTWARE DESCRIPTION

LabVIEW(short for Laboratory Virtual Instrumentation Engineering Workbench) is a system design platform and development environment for a Visual Programming Language from National Instruments.

Originally released for the Apple Macintosh in 1986, LabVIEW is commonly used for data acquisition, instrument control, and industrial automation on a variety of platforms including Microsoft Windows, various versions of UNIX, Linux, and Mac OS X.

LabVIEW is a graphical programming platform that helps engineers scale from design to test and from small to large systems. It offers unprecedented integration with existing legacy software, IP, and hardware while capitalizing on the latest computing technologies. LabVIEW provides tools to solve today's problems—and the capacity for future innovation—faster and more effectively.

Visual Basic, C++, JAVA, and most other computer languages are text-based programming languages. LabVIEW, on the other hand, is a platform for virtual programming. This makes it easy to create VIs(Virtual Instruments). LabVIEW software is ideal for any measurement or control system, and the heart of the NI design platform. Integrating all the tools that engineers and scientists need to build a wide range of applications in dramatically less time, LabVIEW is a development environment for problem solving, accelerated productivity, and continual innovation.

VI. APPLICATION AREAS

- Acquiring Data and Processing Signals
- Instrument Control
- Automating Test and Validation Systems
- Embedded Monitoring and Control Systems
- Academic Teaching

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VII. PROJECT DESCRIPTION

In general, consumer electronic equipment use remote control for user interface. Replacing the remote control system by means of hand gestures is an innovative user interface that resolves the complications in usage of remote control for domestic appliances. The project deals with using hand gesture to perform the basic controls in electronic equipment like TV, laptop, etc. The block diagram of the proposed model is shown in Fig.3.

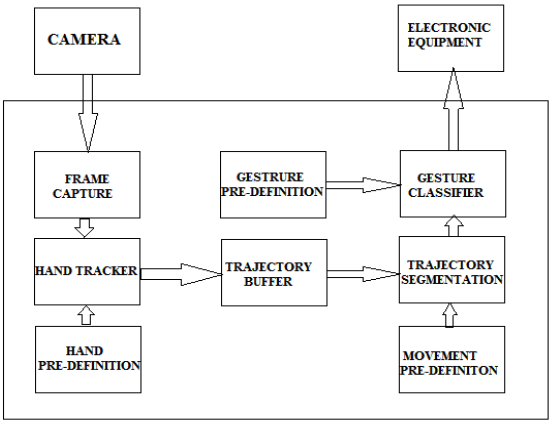

Fig.3. Block Diagram of Proposed model

This type of user interface using gesture has advantages of ease of access and human machine interaction. Gestures are a natural form of communication and are easy to learn. However using gestures to control electronic equipment requires gesture recognition algorithm and adequate hardware relating to it.

VIII. EXPLANATION

There are three phases involved in the project, namely, Pattern matching, Hand tracking, Control using gestures. The three phases are explained briefly.

a. Pattern matching:

First, an image is captured, to be used as a template for pattern matching. We save the template image in .png format for easy reference. We create the template image by selecting the region or object the users are interested in to use as a tracking reference.

b. Hand tracking:

After the template image is created, the program uses it as a reference to search inside the continuously updated image being captured by the camera. By comparing the captured image to the saved template, the program can continuously track the hand

c. Control using gestures:

Using these two functions, we can control equipment. In this project, controlling the laptop functions.

IX. SIMULATION AND RESULTS

When the first gesture is detected, the first case structure receives a TRUE value, the Calculator opens, as in Fig. 4.

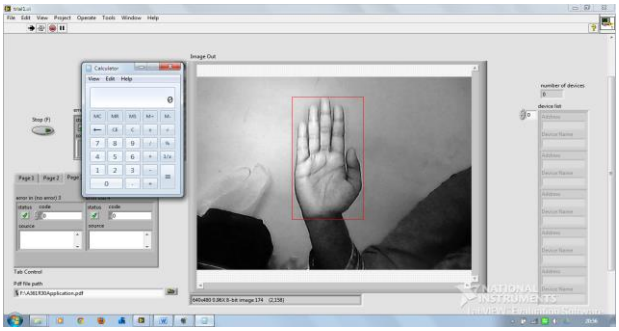

Fig.4. Opening Calculator using gesture

When the second gesture is detected, the corresponding case structure receives a TRUE value and the Notepad opens, as in Fig.5.

Fig.5. Opening Notepad using gesture

When the third gesture is detected, the corresponding case structure receives a TRUE input, the active Bluetooth devices are detected, as in fig.6.

Fig.6. Discovering Bluetooth Devices using gesture

When the fourth gesture is detected, the corresponding case structure receives a TRUE input, the PDF document specified in the file path opens, as in Fig.7.

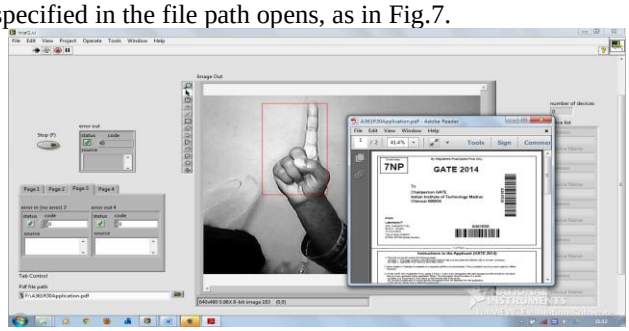

Fig.7. Opening a pdf document using gesture

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X. CONCLUSION

The proposed model involves static user defined gestures to control electronic equipment like laptop, TV, etc. The software used for performing the control is LabVIEW. The main problem during implementation of the code is that, more time is taken for LabVIEW to recognize the gesture. The proposed model is sensitive to light intensity and rough background. Overcoming these difficulties is suggested as future work. The use of dynamic gestures for the same can also be implemented in future.

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