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TELEVISION CONTROL BYHAND GESTURES USING CONTOUR POINTS

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Abstract:— Embedded System based gesture recognition control system which provides 100% touch-free interaction with the device. Intuitive gestures like virtual mouse tracker provides the most complete touch-free interaction system available in the market. In the existing models in order to change the TV channels, the flex sensors are placed in hand to give a particular gesture as input and control the television, but it is not efficient. In the proposed model only by using the contour points in hand to perform quick actions to change a channel. It is done by using the hardware system consists of AT89S32 bit microcontroller and Open CV library which helps for image/video processing by using various features and classification algorithms. It overcomes the performance in terms of sensors and hardware cost which is also too high. This system takes capture image by means of web camera connected to ARM microcontroller through USB and the image is processed by using Open CV library. According to the User's hand Gestures the TV Operations should be performed.

Keywords: Virtual, Hand Gesture, Image processing, OpenCV, Microcontroller, Television.

I. INTRODUCTION

As gesture recognition technology has improved, gesture recognition systems have been gradually applied to electronic appliances in the daily lives. TV is a representative consumer device to which gesture recognition techniques are being dynamically applied. 3D motion sensors, which have gradually been applied to TVs, are useful for recognizing various complex motions for natural human-to-TV interfaces. The following obstacles still need to be solved. 1) It is difficult to achieve competitive price and performance for high-end sensor units compared to low-end remote controls. 2) Dedicated hardware or motion recognition is absent. Resource allocation is required to process sensor signals. There is some statistics says that 20% resources for hand gestures can be afford to interface the TV &30% for face recognition, and 10% for voice recognition, so the remaining 40% of all are available to process the TV tasks. This reduces the quality of system performance. Although extra computing resources can be added, the price must rise. 3) Lastly, the user interface provides low usability. Although such interfaces can provide momentary entertainment and interest, users are often unwilling to always adopt this unfamiliar method. Gesture recognition is a topic in computer science and language technology with the goal of interpreting human gestures via mathematical algorithms. The human hand is capable of an enormous range of poses. In this research we can only focus on 7 poses including 6 poses from no finger to five fingers and OK symbol of sign language. These are the methods that are possible to employ with a good result.

II. LITERATURE REVIEW

In order to make the communication between a normal person and a dumb person easy. The system is designed with a minimized cost and higher accuracy. The dumb aid phone has a camera for capturing the hand gestures shown by a dumb person. The orientations of the fingers of the hand are identified by extracting the outline of the hand in thecaptured image. This outline is then compared without line of the hand gestures that are stored in the database of the device. When match is found the sound file or voice note corresponding to the gesture, in the database is send to the normal person on the other side of the communication line. The image processing consists of mainly two steps, training and testing. The training step deals with database creation. The image of the gesture captured is pre-processed by changing the brightness, contrast, sharpness etc. After that the feature is extracted from the image. Open Source Computer Vision Library[2] that includes image processing functions. All the processing will be done using ARM based platform like Panda Board which is an OMAP4430 platform designed to provide access to as many of the powerful features of the OMAP4430 Multimedia Processor as possible, and it will be maintained with low cost. In this innovative world, there square measure most of individuals World Health Organization (WHO) square measure deaf and dumb ought to have a tiny low dream on communicate as traditional people with others are not a straight forward task[3]. An electronic glove is developed for deaf-mute communication system that helps out the deaf and dumb individuals to speak with dependability. Here only 1 hand is employed. Then, four flex detectors are employed and every square measure fitted with length of every finger of glove. The hand gesture plays a key role. The gestures are decoded by

microcontroller. Message will be shown in alphanumeric display and voice output will produced from speaker.

Hand tracking and hand gesture recognition [4] is an important problem in the field of human-computer interaction. In the current literature, there are a number of solutions have been proposed but the problem is still far from being solved since the hand exhibits significant amounts of articulation and self-occlusion that will leads difficulties with existing algorithms. To further exasperate these problems, interactive applications requires that the hand tracking perform in real-time. The current ubiquity of webcams offers many opportunities to create computer vision systems which can enable novel new methods for human-computer interaction. At the end, we present a system which allows the user to control the operating system cursor in a hands-free way by gesturing in mid-air. Our system leverages OpenCV and the X windowing system to track the index finger and thumb of a user using a webcam. [5] describes

motion data gloves which is frequently used input device that interpret human hand gestures for applications such as virtual reality and human-computer interaction. However, commercial motion data gloves are too expensive for consumer use, and this has limited their popularity. This paper presents a less cost motion data glove to overcome this obstacle. [6] describes gesture recognition technology has improved so much, it has been applied to various consumer appliances to provide natural interfaces. Television is a representative system for this kind of interface because of its complex requirements for various functions. Icon-based interfaces are the general method used. However, according to the performed survey, various functions were not required for watching TV. This work found most viewers mainly tend to use some specific functions such as channel or volume. These functions should be controlled easily and quickly since they are frequently used. However, the icon-based interface has difficulty fulfilling this requirement since it is affected by Fitts' law. Gesture-based method for easy and quick control describes in [7-11]. User hand gestures are recognized by capturing the motion path when the user draws different symbols in the air. These gestures are used to interact with the TV. It is implemented using a single-camera dedicated hardware system. This system is based on a real time parallel processing structure. The analysis shows that subjects enjoy this TV control system.

The rest of the paper is organized as follows: Section II describes existing model. Section III projects the proposed model. Section IV includes the results and discussion and section V concludes the paper.

III. EXISTING MODEL

In existing system new principles or the adaptation of existing ones are required for gestural interfaces, especially those without a GUI. Most computer-based assistive technology products have been developed for relatively small groups of users, and have consequently been rather expensive and specialized for specific user groups. Input methods such as voice recognition and remote control using a smart phone have been attempted with a use of voice guidance of operation and menu are used in existing system as shown in Figure 1. The users were negative at pointer-type gestures and showed their concerns about large motions of linear gestures and difficult matching of circular gestures. Various initiatives have improved the human-computer interaction over the last decade. New technologies, such as virtual reality and motion sensing, enable qualitatively different interfaces and implicitly deriving user feedback. Detecting the body position and gaze (i.e. the direction of face/eyes) of people can provide insights into the level of attention or interest. Studies have shown a strong correlation between aspects of body language, such as body lean and the orientation of the head, and the attention payed to what is being said. Disengagement and frustration may coincide with closer postural positions and more movement, whereas focused attention and less frustration occur with more distant, stable postural positions. Systematic observation of people's movements in a specific context has various applications, assessing disruptive and off-task classroom behavior.

Various methods have been proposed to detect body position. For example, pressure sensors have been used for detecting a lean back position. Unfortunately, such an intrusive measurement method has shown to influence people's behavior. Physical contact with sensors makes users aware of being tracked, thereby changing their behavior

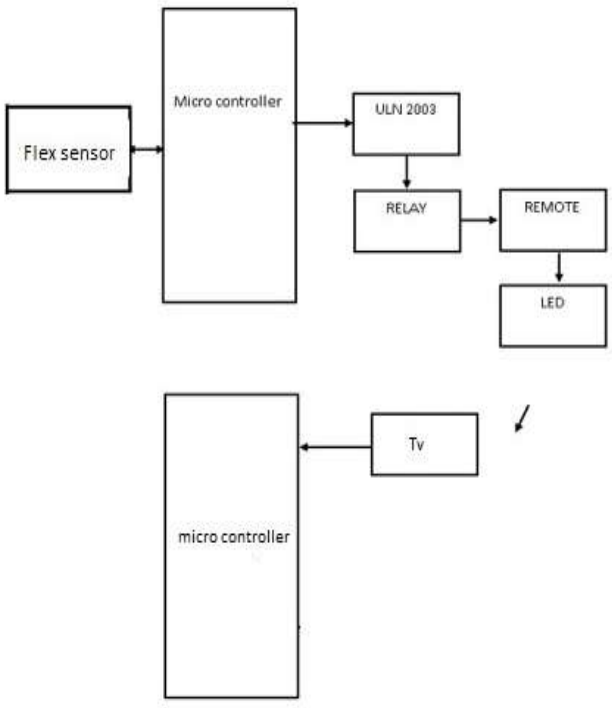

Figure 1. Block Diagram of Existing Model

Gesture Control is based on the Gestures-WPF project, which allows recognition of basis hand gestures. The gesture database is built upon labeled training videos of the

gestures that have to be recognized. For each of these training videos recorded using the Kinect, the start and end frame of the hand gesture are marked. Recognition of these gestures is based on distinctive features, such as the speed of movement or the direction. In our intuitive interface, gesture control is used to browse through the content. One hand is used as a reference, while the other is used to browse through the user interface.

IV. PROPOSED SYSTEM

In this system, user hand gestures are recognized by capturing the motion path when the user draws different symbols in the air. These gestures are used to interact with the TV. It is implemented using a single camera dedicated hardware system. The camera can detect hand gestures. This system captures the gestures from web-cam which is connected to micro controller through USB host and the image is processed by means of image processing technique. Here we are using Open CV library to detect a frontal hand as an image using its Haar Cascade hand Detector, this will increase the human computer interaction. If any gesture is recognized by the camera, a rectangular box will appear on monitor. The identified gestures are sends to Raspberry PI board and we can perform TV related functions. In this way we are implementing single camera dedicated television control system using gesture drawing.

Figure 2 shows the block diagram of proposed model Television control using contour points. At the beginning the webcam is fixed along with the personal computer that had been employed for the project. At initial the webcam is placed and checked for its working. Now the silver light software is installed in the personal computer that is going to be used for project the silver light is used to find the function of the webcam and its connection to the computer. The silver light is one of the most used software to verify the performance and presence of webcam and connection. Now open the application and check the picture and set up the quality that is required. Then install the python for the personal computer because we are going to employ the OpenCV software in python it is called OpenCV python in general. Python is the best way to interact with the microcontroller and other peripherals. Now open the OpenCV software and setup the packages required to work with python. Enter the code that has to be carried out for the functioning of the project in the microcontroller using the keil compiler. Also make the code that is required for the interaction of the kit with television.

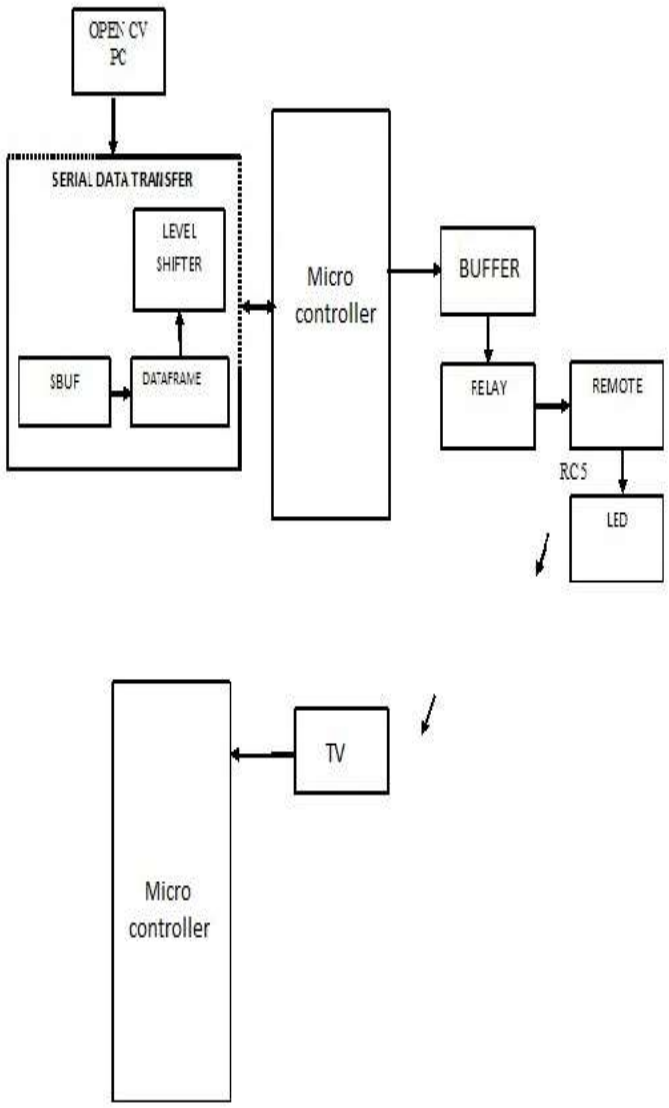

Figure 2. Block Diagram of proposed system

V. RESULTS AND DISCUSSION

A. WORKING

This project is started by setting up all the connections and checking out that all the kits are working in a proper manner. Now the procedure starts from the webcam as shown in Figure 3, the webcam is mounted on the lap top and it is connected to the personal computer. Now the working of webcam is verified by using the silver light software. Now open the OpenCV stimulation tool and search for the OpenCV python code that is used for giving the instructions to be carried out. Now open the python code and compile the program. Now we can see that its starts capturing the pictures. Now place the hand gesture to carry out the instruction that has to be performed. Since the contour points is enabled the

area of capturing and searching for the convex hull is carried out successfully

Figure 3. Webcam

Now the captured image is carried out to the microcontroller kit as shown in Figure 4 through the serial data transfer cable. In general, it is called as MAX232 IC which is used to convert an RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits.

Figure 4. Microcontroller Kit

The data is now fed into the microcontroller kit where the instructions are been predefined and the actions that should be carried out for the prescribed hand gesture. Now this data is passed to the ULN2003.The ULN2003 is a monolithic high voltage and high current Darlington transistor arrays. There are seven NPN Darlington pairs that feature high-voltage outputs with common-cathode clamp diode for switching inductive loads. Assume that the collector-current rating of a single Darlington pair is 500mA.The Darlington pairs may be parallel for higher current capability. Applications include relay drivers, hammer drivers, lamp drivers, display drivers (LED gas discharge), line drivers, and logic buffers. The ULN2003 has a 2.7kW series base resistor for each Darlington pair to operate directly with TTL or 5V CMOS devices.

The output from the ULN2003 is passed into the relay as shown in Figure 5 where according to the data the relay acts as open or closed switch. When the input is high and a prescribed voltage it is passed to the remotes led and then to the television and the required action is performed.

Figure 5. Relay Setup

The television is the general device that is used by most of all the people without any difference in their status. But however, there are also many smart televisions are in the market which provides the user recognition and also the ability to interact with the television using hand gesture. But over aim is to provide this facility to all classes of people. Figure 6 illustrates that the general television is used in the below sections.

Figure 6. Television

Now Figure 7 shows the entire kit that is employed to achieve this task. All the components that had been shown in above paragraphs are combined together to perform the whole task. The general view of the kit is shown below.

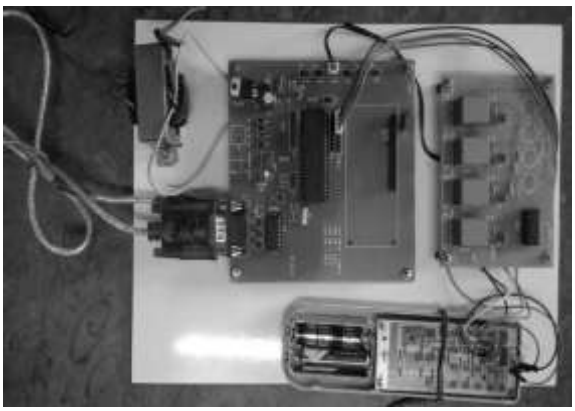

Figure 7. Complete Setup of Project

In this proposed model the input is given in a dynamic manner which means the input is taken and given in live. Whereas in the existing model the input is given as a

predefined image and each image has its own value and according to images value the defined actions takes place. This had a limited instructions and actions and it is not efficient and accurate. So, to overcome these circumstances the proposed model is made. Here we can perform multiple tasks at a time and with an accurate and dynamic manner.

The using of sensors has also faced its disadvantages. In employing the sensors, there is a necessity for the sensors to replace in time due to their high use and functions. The life time of the sensors is also low, so there is need to buy them periodically these are the major problems .so to overcome them the best is to use the image processing as it is nonvolatile and they give the best accurate results.

The use of contour points in image processing had laid a new path for the hand gesture technique in which there is no need to search the whole body and just search for the convex area. Thus, the area for the searching is made limited so the response time is also improved. The convex hull is recognized and then by removing or changing the fingers the shape of the convex hull changes and thus different operations can be performed for each gesture.

VI. CONCLUSION

The project "Television control by hand gesture using contour points" developed from scratch of hand gesture technique. This included the cross compilation and deployment of essential libraries, the configuration of embedded Linux and cloud computing technology for the development of specialized TV controlling using gesture recognition. The use of hand gesture technique in daily bias helps in reducing work load in various environments. In particular the employment of hand gesture in television control had developed a new path in improvising the human interaction with the technology. Our project deals with these circumstances and laid a new layer in interaction with the television and also in other daily life electrical peripherals. This project avoided the use of remote control and prevented the errors causing by them.

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