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SEMIOTICS RECOGNITION SYSTEM

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Abstract— **The Windows OS is powerful, serving a larger prospective for the development of the various applications through third party application & their standard allows supporting browser to stream video and audio content directly from native devices such as webcam enabling the gesture recognition within the browser window.**

Using hand gesture for this type of interaction would make it interesting. Hand gesture recognition interface is becoming a popular mode of interaction with the system. Using gestures makes the interaction easy and eliminates the use of complex input devices. However gesture recognition is a challenging task because of complex background and various hand motions.

In this project, an attempt will be made to present a technique of Image Processing based on Gray Scale Histogram of the image with the aim to develop a system which recognize gesture easily that can be used to navigate third party applications. Semiotic recognition system doesn't require any wearable devices, gloves or any kind of complex or indirect controlling devices for detecting hand gestures. For detecting hand gestures, simple web camera is used. This particular recognition system intends to provide a new dimension in the field of user interface and new perspective in user interface.

Keywords— ***gesture recognition, image processing***

I. INTRODUCTION

Image Processing is the domain where the images captured from sources such as videos or web camera and are processed using image enhancement techniques to filter noise and to enhance the area of interest. Image processing is nothing but to analyze and manipulate a digitized image, especially in order to improve quality of that image and use it for further operations.
Semiotics is something that can be interpreted as a sign or a gesture having a certain meaning. Semiotics can work through any of the body senses and their meaning can be intentional such as a word uttered with a specific meaning, or unintentional such as a symptom being a sign of a particular medical condition. Semiotics is a sign which is able to communicate the information to the one interpreting or decoding it.
In this project as discussed earlier we can use simple Web camera. Our work is dedicated to calculate threshold value for the filtering background grayscale value which acts as a noise in the image/histogram. Usually in gesture recognition systems threshold has a fixed value for the filtering the background object so that the area of interest can be brought into focus. When user wants to interact with the system using Semiotics Recognition System, user needs to align his gestures with the web camera so that it can be detected and processed.

II. ALGORITHM

A. System Architecture –

The system is used to operate the third party applications using the gesture control mechanism. In this project the system tracks the hand gesture through the simple web camera with the help of the predefined threshold values used in the algorithm. After detecting the hand a frame from the image is captured and the centre region is tracked and the centre pixel is allocated to the frame. Then the centre region and the frame is provided to the hand gesture recognition algorithm and the operations takes place with the equivalent movements of the gesture tracked by the web camera.

The technique depends on the following approach:

1) ***Acquisition:*** a frame from the webcam is captured.

2) ***Segmentation and detection:*** the image is segmented into two parts, both of them are manipulated simultaneously before analysing the resultant data, skin pixels and moving patterns are detected. A new image is created containing the location of the centre of the moving hand.

3) ***Tracking:*** 10 latest consecutive frames are tracked continuously; in each frame the centres of the moving hands are detected.

4) ***Pattern Recognition:*** through the user's hands motion, the features are compared with those stored in the database, the maximum likelihood correspondence is chosen.[1]

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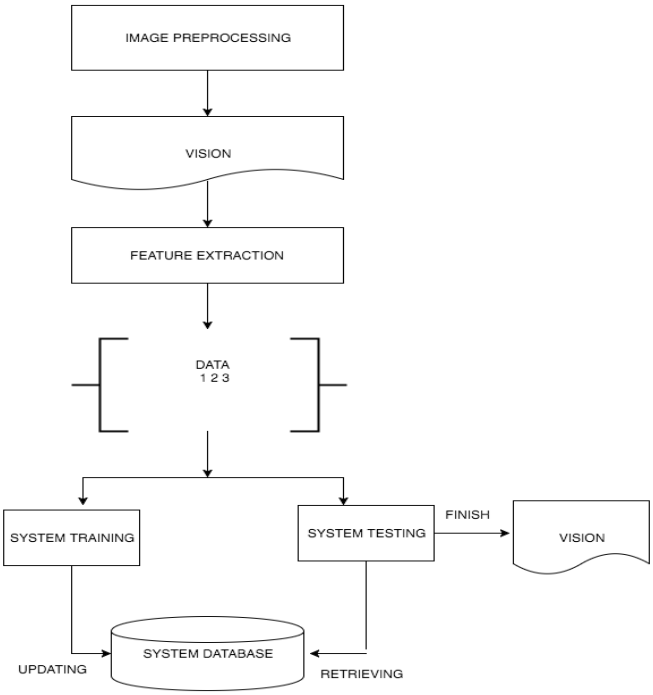

Fig. 1. System Architecture [4]

B. American Sign Language Testing Algorithm –

1) Add training and test directories to path.
2) Define variables.
   a) Define number of alphabets used
   b) Define number of training images.
   c) Initialize image matrix by defining rows and columns.
3) Perform pre-processing of Training Images.
4) Perform KNN and SVM classification.

C. Algorithm to test Principle Component Analysis –

1. Find Covariance matrix in terms of vectors.
2. Sort and eliminate those whose eigen value is less than threshold.
3. Sort the Eigen Vectors from ascending to descending sequence.
4. Normalize Eigen vectors to unit magnitude.
5. Find Eigenvectors of actual Covariance matrix = ImgMat*ImgMat'.
6. Normalize the Eigen vectors.
7. Show the PCA extracted features.

8. Find the weight of each original symbol in the training set in transformed space.

D. Algorithm to detect the gesture and show the matched Output –

1) Add training and test directories to path.
2) Define variables.
   a) Define number of alphabets used
   b) Define number of training images.
   c) Initialize image matrix by defining rows and columns.
3) Perform pre-processing of Training Images.
4) Perform KNN and SVM classification.
5) Display Input and Matched Output**.**

E. Algorithm for Gray scale Histogram of an Image –

1) Make gray scale histogram of an image.
2) The range lies from 0 to 255.
3) Define a threshold value for detecting features.
4) Detect the noise in picture and suppress it using image enhancement techniques.
5) Extract the area of focus.
6) Scan histogram in decrement order until first frequency value larger than threshold is detected.
7) It is assumed to be an outstretched arm whose motion should be detected.
8) For more precise filtering as we subtract constant value from threshold, be analysis 1.5 as constant to be subtracted.
9) Accuracy depends on camera resolution.

Using this algorithm we can detect gestures from the distance 1-2 meters.

F. Zero Normal Cross Co-relation (ZNCC) –

Zero Mean Normalized Cross-Correlation or shorter ZNCC is an integer you can get when you compare two grayscale images. Let's say you have a webcam at a fixed position for security. It takes images all the time, but most of the time the room is empty. So lot of images will not be interesting. They only waste space. So you want to get rid of those redundant images.

But those images are not identical! Even if the scenery didn't change, your sensor will produce slightly different results. A human will not notice them, but you can't simply compare images bit by bit. Even if you could, the images will be different because the sun moved (and so do shadows) and perhaps you have a clock in the image.

III. EXPERIMENT AND RESULT

The gesture to be recognized is to be retrieved from Matlab Database. Matlab R2014a software platform is use to perform

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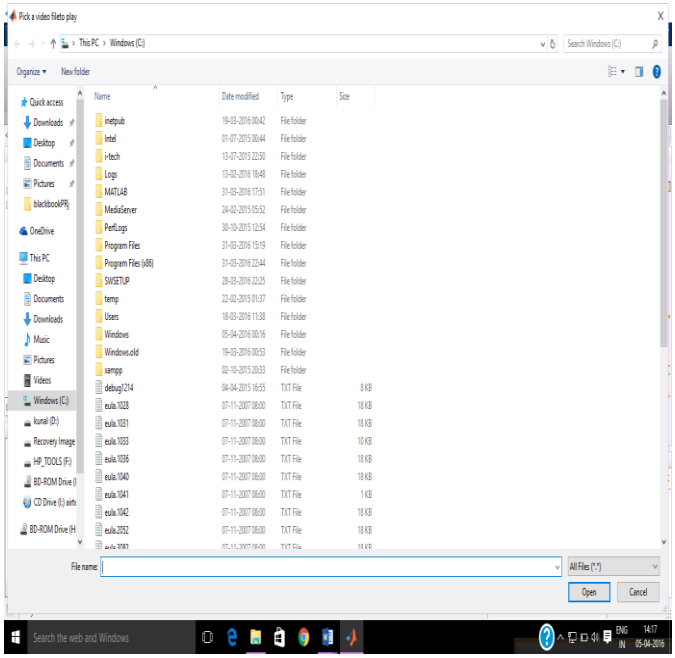
the experiment. The PC for experiment is equipped with an Intel core i3 2.4GHz Personal laptop and 4GB memory.

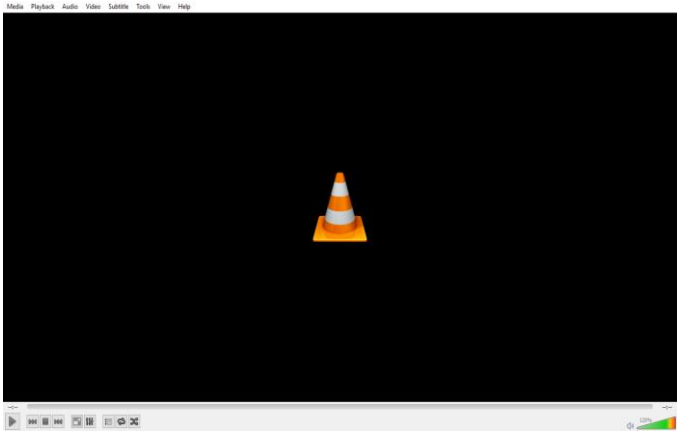
The scheme is tested using ordinarily image processing. From the simulation of the experiment results, we can draw to the conclusion that this method can detect gestures which are predefined by American Sign Language (ASL)

Our experiment is to open a specific application and to control it using gestures.

4(a)



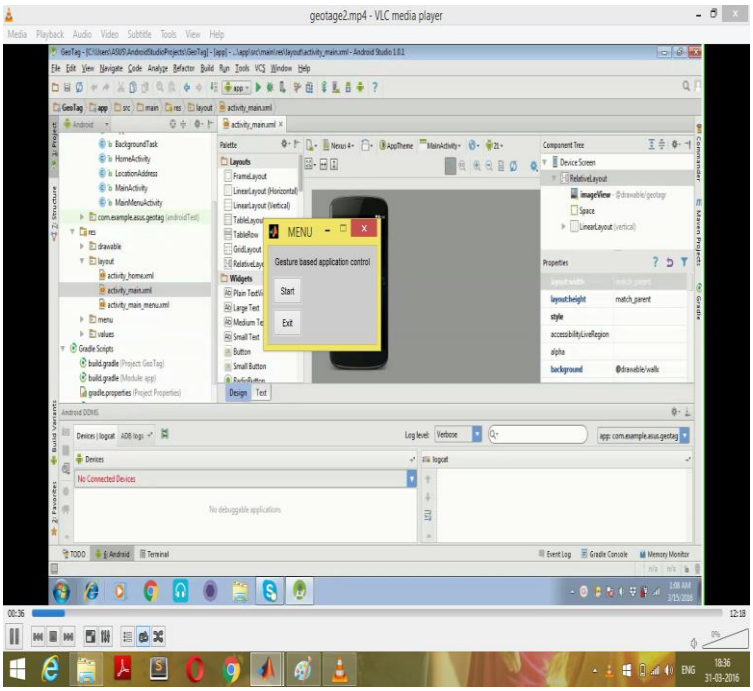
4 (b)



4(c)

Fig. 4. (a) "V"gesture done (b) specifically asks to open a file (c) opens file in Video player(eg.VLC)

As fig.(4) represents the initial steps necessary to generate an outcome.Below in fig(5) the actual control over the system by doing gesture is shown :



5(a)

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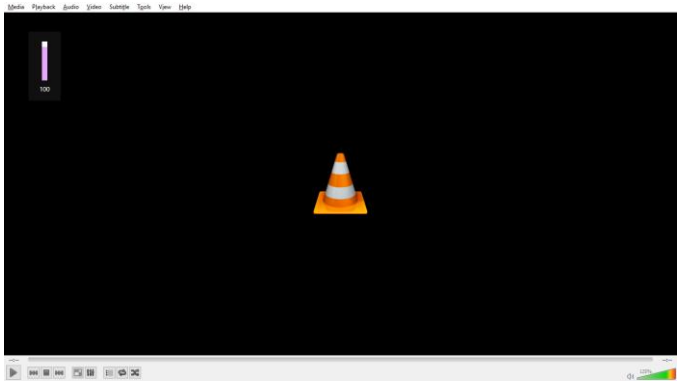
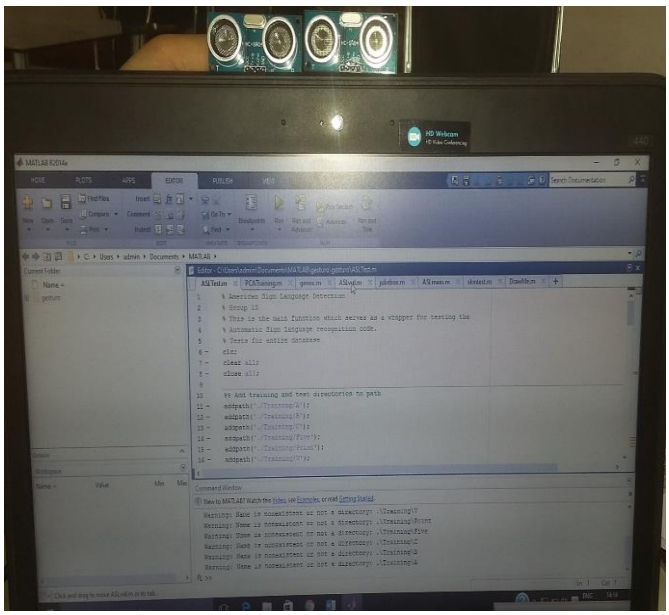


5(b)



5(c)

Fig(5) (a) console for controlling application using camera (b) volume increased by doing gesture (c) HC-SR04 censors used for detection

According to the gestures the features like volume up and volume down is controlled. The scrolling up gesture indicates the volume up feature and scrolling down gesture indicates volume down feature. As seen in fig 5(c) 2 sensors are used: to detect depth and to detect direction

IV. CONCLUSION

In present environment a number of facilities and various modes for providing input to any application are available. It is though unfortunate that with the ever increasing smart environments and corresponding input technologies still not many applications are available which are controlled using current and smart facility of providing input which is by hand gesture. The most important advantage of the usage of hand gesture based input modes is that using this method the user can interact with the application from a distance without using the keyboard or mouse. The application of manipulating system features through hand gestures in virtual environment is being implemented in the project provides a suitable, efficient and user friendly human computer interface. With the help of this application the user can interact with the computer system using hand gesture instead of any other physical input devices .As the application provides the flexibility to the users and specifically visually impaired users to define the gesture according to their feasibility and ease of use. As future work, we plan to use hand gesture classification algorithm for controlling the TV such as turning TV on and off, increasing and decreasing the volume, changing channels etc.

V. REFERENCE

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