Hand Gesture Recognition System for Photo Viewer Application

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Abstract: Humans communicate with one another not only through their vocal abilities but also through the gestures that they make. A gesture can go a great way in putting through our point and making the other person understand us and computers are no different in this and can be controlled and made to respond to hand gestures using a gesture recognition system. Today Human Computer Interaction is an interface with which we can virtually interact with the Systems with an ease Humans communicate mainly by vision and sound; therefore, a man machine interface would be more intuitive if it made greater use of vision and audio recognition. Another advantage is that the user not only can communicate from a distance, but need have no physical contact with the computer Gesture recognition can be seen as a way for computers to begin to understand human body language, thus building a richer bridge between machines and humans than primitive text user interfaces or even GUIs (graphical user interfaces), which still limit the majority of input to mouse. The results obtained convey us that there is a good alternative to mouse that is by using gesture.

Keywords: Human Computer Interaction, GUIs (graphical user interfaces), Hand Gesture Recognition System.

I. INTRODUCTION

The importance of computers has increased to a great extent these days. Then it can be used for general purpose or at work places. Even there is a demand of more and more application based devices, where the latest example can be of smart phones. Traditionally, we use hardware devices i.e. the mouse and keyboard to interact with the system.

But due to the growth of technology and demand of virtualization, this technique has been proposed. An alternative way for touch screen can be creation of a virtual human computer interactive device. Hand gestures play a vital role in gestures recognition. This section highlight about the usage of hand gestures in controlling the computer system by performing simple command without the use of traditional controlling device mode such as either of mouse or keyboard.

In this system, first the input image is captured and after pre-processing on it is converted to a binary image to separate hand from the background. Then centre of hand is calculated and computed calculated radius of the hand is found. Fingertip points are been calculated using the Convex Hull algorithm. All the mouse movements are controlled using the hand gesture. Gesture based recognition technique to handing Computer application. In this system, a gesture recognition scheme is been proposed as an interface between human and machine.

Human–computer interaction (HCI) is the study, planning and design of the interaction between people (users) and computers. It is often regarded as the intersection of computer scienc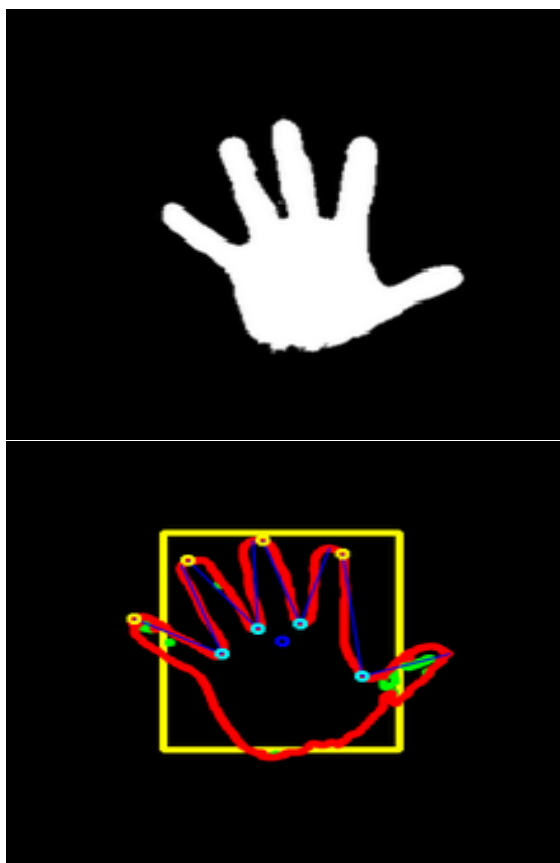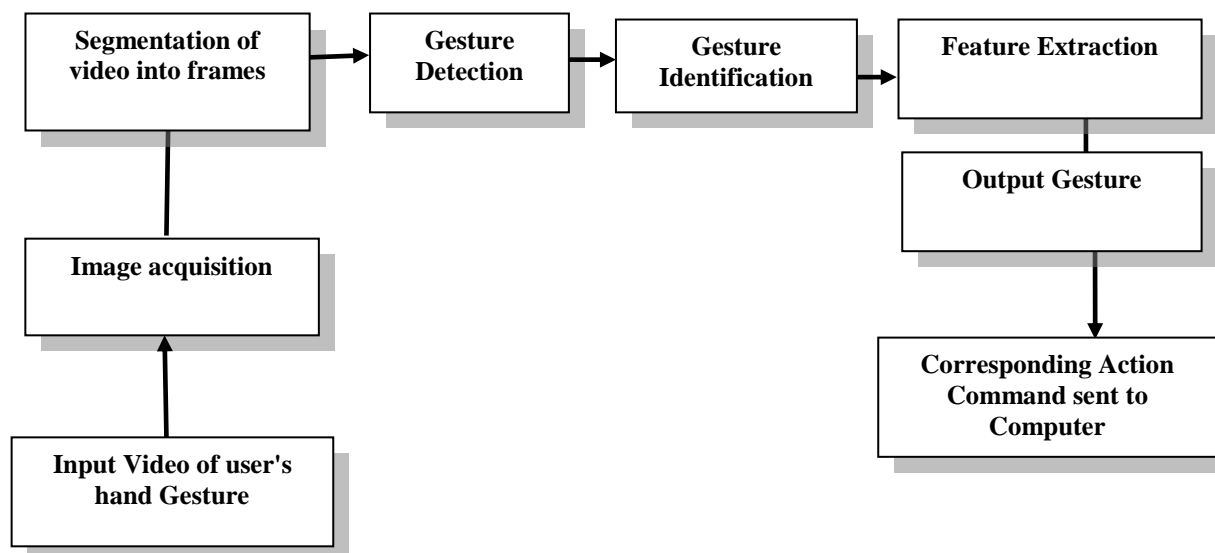e, behavioral sciences, design and several other fields of study. Interaction between users and computers occurs at the user interface, which includes both software and hardware; for example, characters or objects displayed by software on a personal computer's monitor, input received from users via hardware peripherals such as keyboards and mouse, and other user interactions with large-scale computerized systems such as aircraft and power plants.

II. PROPOSED METHODOLOGY

The proposed system is a real time video processing that is based on a real time application system. This can replace one of the traditionally used input device i.e. mouse so that simply by using the hand gestures the user will be able to interact naturally with their computer. The basic block diagram of the overall proposed system is as shown below in the figure.

As soon as the palm is detected by the camera, it starts capturing the images and takes out the current images and starts processing. The processed image is given as input to the next phase of processing where it starts detecting the palm following the centers and edges. These all extracted features are used for the further processing such as detecting hand gestures and working according to it.

In the proposed architecture, the input is given through the hand gesture to the web camera. The web camera captures the images of the hand gestures. The image processor recognizes the gestures and then deduces the gestures into signals.

Segmentation of video into frames → Gesture Detection → Gesture Identification → Feature Extraction

Image acquisition

Input Video of user's hand Gesture

Feature Extraction → Output Gesture → Corresponding Action Command sent to Computer

A convex hull algorithm for Hand detection and gesture recognition is used in many helpful applications. As the skin color can be much efficiently differentiated in the YCrCb Color Model so this model is preferable than RGB and HSV. For a more efficient detection, implementation of a background subtraction algorithm is used to differentiate between skin like objects and real skin colors. Initially, a frame is captured with only the background in the scene, after that, for every captured frame, each pixel in the new frame is compared to its corresponding one in the initial frame, if they pass a certain threshold according to specific algorithm computations, then this pixel is considered from the human body and it will be drawn in a new frame with its original color. If this pixel is below the threshold, then those two pixels are considered the same and they are considered as background so the corresponding pixel will take a zero color in the third frame. After repeating this for all frames' pixels, now we will have a new frame with only a human appearing in it, and all the background took a color of zero.

III. WORKING

Step 1: Input Video of user's hand Gesture
Step 2: Segmentation of video into frames
Step 3: Hand Segmentation.
Step 4: Hand and Rotation Shape Feature Extraction
Step 5: Hand Gesture Recognition.
Step 6: Corresponding Action Command sent to system.
Step 7:Control an application

1. Video Segmentation:
Video segmentation is a ways of dividing a video into meaningful segments.
As a result,video segmentation returns the exact time points of slide changes on the timeline.

2. Hand Segmentation:
The main object of hand segmentation is to separate the user'shand from the background in the image.
This can be achieved by using different image segmentation algorithm. The segmentation process should able to produce proper image to hand gesture recognition.

3. Feature Extraction:
The feature extraction methodology is applied to our approach as follow:
1. Applying median filter, to remove various types of noise from the binary image.

Median filter typically operates on small neighborhoods (3×3) window.

2. Applying image filling to remove holes, which are is a set of background pixels from the binary image.

3. Find corner points in the hand binary image.

4. Trace the exterior boundaries of binary hand image.

4. Hand gesture recognition:
For hand gesture recognition we are using Convex hull algorithm:
Now we define the complete editing algorithm described as below:

Step 1: Compute the quality and confidence for convex hulls of both the main cluster and all clusters, denoted as Cqm and Cqa, Ccm and Cca.
if (Cqm>Cqa) use the main cluster;
else if (Cqm<Cqa) use all clusters;
else if (Ccm>Cca) use the main cluster;
else use all clusters;
All following editings are conducted on the cluster(s) determined in this step.

Step 2: This step involves the detection of sharp angles. Projections of rectangular or
cylindrical objects should not have any acute angles. Thus lines that have contribute to
the creation of such an angle are removed, the convex hull is recalculated, and the
process is repeated until no such angles are found.

Step 3: Compute the edge confidence for all the edges of the convex hull.

Step 4: If all edges have high confidence go to Step 6. Otherwise identify the longest sequence of low confidence.

Step 5: Eliminate the low confidence sequence by removing all lines that contribute to it.Re-compute the convex hull and go to Step 2.

Step 6: Locate the most distorted vertex of the convex hull by examining parallelism and edge confidence and remove lines associated with it.

Step 7: Evaluate the quality function Cq and if it is below a preset threshold, we exit and decide that the object cannot be located, otherwise go back to Step 2. We also keep track of the values of Cq and if its value decreases, we reverse a sequence of steps and exit.

IV. CONCLUSION

With our proposed system we can identify a particular human gesture and convey information to the computer. Overall aim is to make the computer understand human gestures, to control through hand postures a wide variety of applications. The proposed algorithm can work with regular webcam camera, which is used to capture live video of the user's hand gestures. The users have performed series of hand gestures in front of the webcam camera .The classification rates were measured according to the output produced by the proposed algorithm with respect to the user's gesture being made. Each user takes few second to carry out his gestures. Each user carried out different hand gesture sequences.

This way of vision based hand gesture recognition does not store any images in database to identify the gestures. The hand gestures are identified based on number of fingers used to make a gesture. So any finger can be used to denote a particular number but this also reduces the number of unique gestures that can be made.

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