HAND GESTURE DETECTION SYSTEM

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Abstract

Hand Gesture detection is now getting a lot of attention because it has a lot of uses and the specialty to connect with machines around efficiently by human interaction to computers. In this we are trying to make a knowhow of hand gesture detection system. The problems of hand gesture detection system are also discussed in this. Conclusion of results, methods, data and difference between different phases are also mentioned. Pros and cons are also discussed. In this project we are trying to understand how the image processing works and how can we use it to make a hand gesture detection system so that we can operate the computer without any physical contact with the machine itself. There are many researches that are done before and are still undergoing. Many big companies are currently working on this technology so that they can make their products even more useful that they are now because this technology has very high scope in the upcoming future. The people that are not mentally stable or weak from mind can also benefit by technology and can operate the computer. We can use this technology to make the computer even more accessible for humans.

1. Introduction

The main motive to build a hand gesture detection system is to make an interaction between human and computer that can be done by recognizing gestures for controlling robots or a simple computer. How do we make this system is understood and interpreted by the computer.

The interaction of humans with computer is also called as man-machine interaction (MMI). Since A computer is insignificant if it not being utilized

by human. There are some features that should be looked before we design this system. The function of the system and the use of the system. Function means the things that the system gives to its user and use means the scope of the system that it can be used efficiently. The system which has these both properties is known as powerful system.

Gestures can be a still image or can be a moving object. The still image one needs less computational power but the moving object needs a lot. But the moving object is very successful in the real-time environment. Some methods use many additional hardware for this such as high speed camera, color marker etc. Some uses color and they extract data from it.

Many recent research shows the current importance of this system and its application is growing at a tremendous rate. They mainly being used in robot control, games and security. This project shows the advancement of hand gesture detection.

2. Hand Gesture Detection: Methods For Extracting Data and Extraction of Characterastics

The Hand gesture recognition system is classified in three steps. We break them in three parts after getting image data from camera. The steps are: Extraction Method, features extraction and classification as shown in Figure 1.
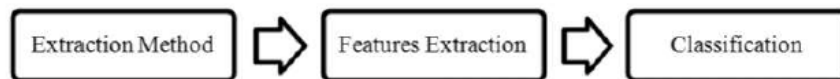

Figure 1. Steps for Gesture Recognition.

2.1. Method of extraction and pre-processing of image

The first process to recognize the gesture is segmentation. In this process we divide the image into different-different parts using boundaries. It depends on the gesture type, If it is a moving object then in needs to be tracked and analyzed, if it is still image it only need to be analyzed. The hand needs to be located first and then separated by using boundaries and secondly, for tracking the hand there are two things to do either the video is divided into frames and each frame have to be processed alone, in this case

the hand frame is treated as a posture and segmented, or using some tracking information such as shape, skin color.

We use the camera to divide the input images into black and white images so that the real object and its background can be identified and the image can be processed by the computer.

We separate the different input images by using separation method. As it shown in the image below.
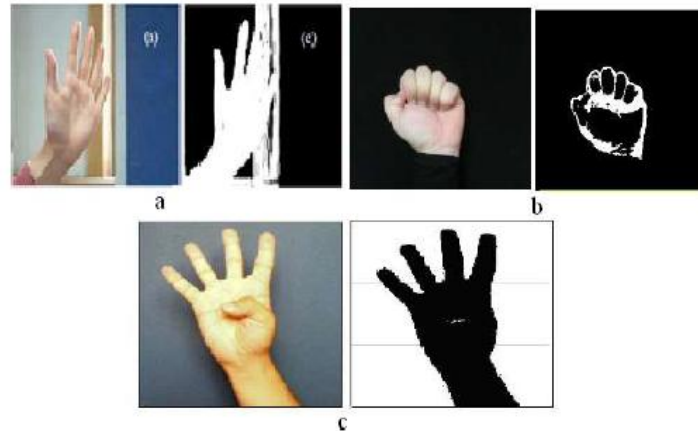

Figure 2. Separation Method (a), (b), (c).

2.2. Extraction of Features

Accurate separation of data is very necessary for accurate extraction of features from the image. Because it plays a very important role in detection of the shape and patters in the images. The first thing we do is represent the aspect ratio of the boundary box. Then we use the other algorithms to capture the shape of the hand. After this we obtain three features from the image that are Palm area, Palm center and Slope of the hand. There are many experiments done by researchers to estimate the right size for the block to get the good recognition rate.
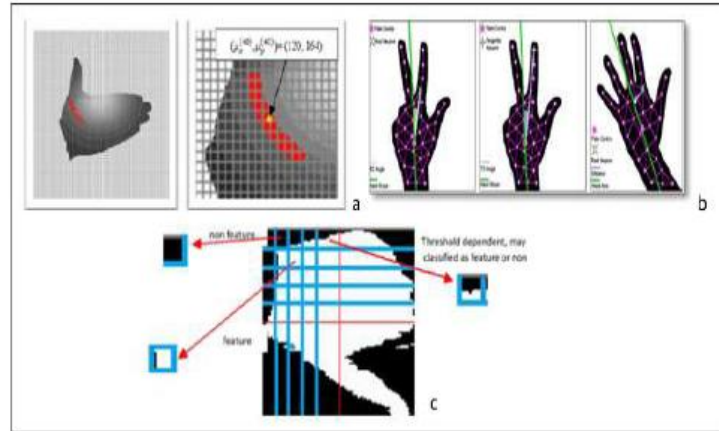
Figure 3. Features representation. (a) Finding the slope of the palm (b) Finding the palm center (c) Finding Palm area.

2.3. Gestures Classification

After all the things done above the classification of gestures comes into picture. It is done by the section of right algorithms and correct test cases. For example edge detection cannot be used for hand gesture detection since many hand signs are generated and could lead to misclassification. Statistical tools used for gesture classification, HMM tool has shown its ability to recognize moving gestures. Neural network are being used in the field of hand gesture detection, and for hand gesture recognition. We have explained the architecture of classification system in figure 4.
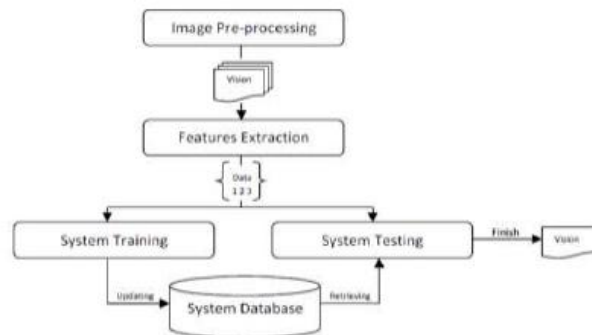

Figure 4. Gesture detection system architecture.

3. Application Fields for Hand Gestures Detection System

Hand gestures detection system is being used for different applications in different fields. Some hand gesture detection application fields are mentioned below.

A. Recognition of Sign Language: Sign language is used by many people who cannot live their life because they are mentally unstable and cannot use computer so they can use sign language to operate the computer as it can be used only by using sign languages.

B. Controlling Robot: We can also control robots with the help of this technology so that our life can be a lot of easier and the robots can do the work for us. We can control then from wherever we want without any manual control.

C. Graphic Designing: Graphic Designing requires the hand gesture to be detected as a preprocessing operation. It is used for twelve moving gestures for drawing and editing.

D. Virtual Environments: One of the popular implementation in gesture detection system is virtual environments, especially for communication media systems. It gives three dimensional pointing gesture detection for human computer Interaction.

4. Drawbacks

Here we will discuss about the drawbacks and limitation of hand gesture recognition system.

A. Irrelevant object might overlap with the hand. If the object is larger than hand it might detect object instead of hand.

B. The performance of the algorithm will decrease if the object is farther from the camera and will not analyze image properly.

C. System can be restricted such as palm should be facing camera or fingers must be vertical and color should be basic.

D. Background lighting will affect image captured by the camera. It can lead to wrong results from the system.

5. Conclusions

In this paper we have discussed about what is hand gesture, how it works and how we implement it by ourselves. The applications of this technology is also discussed in this paper. The main point of hand gesture detection is building an efficient machine that can interact with human. We can do this by using sign languages so that not only normal people can use it but people who are mentally not stable can also use it. Because of its scope in future many companies are focusing on this technology so that they can make suck machines that can interact with human more efficiently.

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