

Virtual Mouse Operation using Hand Gesture

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Abstract

Computer technology is the most basic and important aspect in every human's life. The basic hardware in computer is the mouse. Human interaction with computer or [HCI] is totally depended upon the hardware component. Many of the researchers worked on this component to make the users work easier and efficient. Therefore this paper regards about the usage of the hand gestures instead of the mouse. Gesture is a most used topic in computer science and language technology. The main goal is to interpret human gesture through mathematical algorithms. These gestures can originate from any bodily motion or state but are mostly considered from face and hand. The proposed system does not use any of the external devices. It is not bound to any Bluetooth device nor the network devices. Instead the gestures are identified using the webcam or built in camera. Then the colors are processed with color detection and segmentation technique. Using this system the user will be able to control few of the mouse operations on their machines. The operations are left click, right click, double click and dragging a file or dropping a file. Actions are achieved by using movements of fingers with color caps in different gestures. This would eliminate the usage of mouse and could only be operated by movements of hands. Finally this project helps in the better development in Human Computer Interaction (HCI).

Keywords: HCI (Human Computer Interaction), Gesture recognition.

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1. Introduction

The growing technology now demands an increase in human computer interaction. This computer human interaction which is a multidisciplinary field of study that focuses on the design of computer technology and mostly on the interaction between humans and computers. Initially concerned with computers, now HCI has increased and outgrown to cover almost all forms of information technology design.

This paper is to develop the virtual mouse for the hand gesture. Although mouse is the essential part of the computer to interact with the computer this project implements hand movements instead of the mouse. In this paper we use hand as the input for controlling the system.

In this Paper we use a simple web cam which is already in the computer. Python is the main programming language along with Open CV library which is used in the project. This is not cost effective. This Paper also helps in the easier way of interaction between the users and the computer.

Initially the image of the users hand is taken as a frames of image, which is later processed to get only the desired image. This is done using background subtraction, which helps in extracting only the area of colored cap movements.

The system is programmed to track these colors and perform the essential actions as per the movements associated with the colors.

Since this system does not use any external devices, hence it's a very efficient way to control the mouse cursor. This system in particular has all the potential to replace the usually used mouse and remote controllers of the machine. But it encompasses a barrier of insufficient lighting support. Thus the system haven't replaced the traditional mouse.

2. Proposed System

In this Paper we have virtualized the mouse operations which uses hand gestures to perform the operations. Gesture can be said as a symbol of natural behavior or exciting expressions, which includes body movements and hand movements. It can be classified as either static or dynamic gestures.

In this Paper, we use the dynamic hand gesture recognition. The hand gesture recognition is based on finger and its movement detection using color caps. Thus, the recognition is achieved by a simple and most efficient rule classifier instead of the troublesome classifiers such as SVM and CRF.

Firstly the hand is recognized using the video captured by the webcam. This video is broken into number of frames to extract image. The main focus is to only extract the colored caps images. Thus the background is subtracted using background subtraction. Then the fingers and the palm have been segmented so as to facilitate the finger recognition.

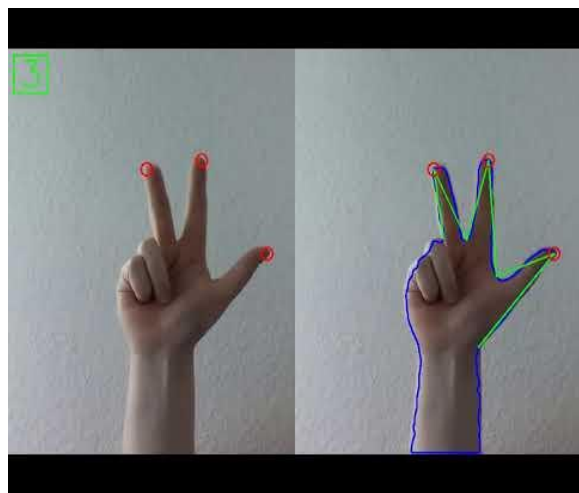


Figure 1: Fingertip detection

A. The Camera [Vision] module

This is the primary input, which takes in the frames of images for preprocessing the data. In our system we use the webcam of the system, which is cost efficient. Colored caps are used to recognize finger and their movements.

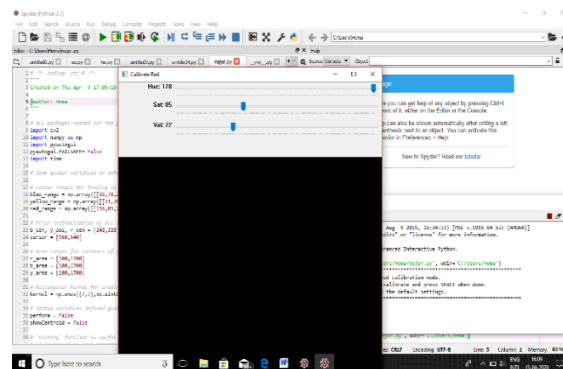


Figure 2: Calibrate Color

B. The Discernment module

This module is associated with the processing of the image. It takes input from the camera module which is a set of frames. The image is then extracted by background subtraction. The constant color taken as a background in this system is black color. It also does the color conversion and noise removal along the process. Outcome of the step will be a grey scale image, which differs by the intensity of the cap from the background image. The images being recognized are shown through the rectangular boxes around the colored caps.

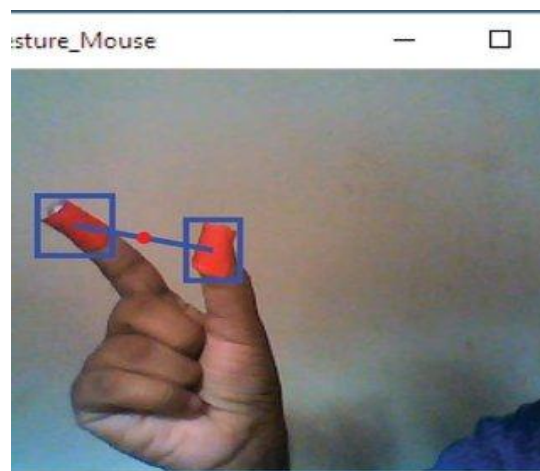


Figure 3: File Drag Drop Operation

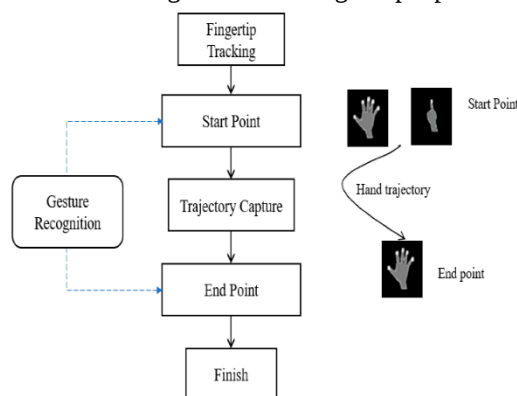


Figure 4: Block diagram

3. Literature Survey

1. In [1], gives an accomplished sign language recognition system. This paper mainly focuses on three main modules: background subtraction, feature extraction and image classification. It uses both discrete wavelet transform (DFT) and K nearest neighbor classification which is used for sign recognition. In this paper it is observed that the KNN provides an accuracy of 99.23% provided it is used with cosine distance metric.

2. The paper [2] has said that in hand gesture recognition, the main focus should be extracting or segmenting of the hand from the background image. Firstly all the RGB color spaces are converted to YCbCr space. Later the skin color segmentation is applied to YCbCr. The background and foreground separation is achieved using the Otsu Thresholding which is a computer vision and image processing tool.

3. In paper [3] the main focus was on machine-user interface which implements the hand based gesture recognition using the computer webcam. There is a multimedia technique involved in this paper. It also has a limitation of having the skin pixels and hand image being segmented before the image is being compared with the stored gesture.

4. The paper [4] had the methodology of recognising the hand gestures using the colour detection with a webcam. As there is a requirement for higher intensity of light from webcam, the proposed system faced intensity issues. Only the bright objects were detected. Moreover it worked well only in computers with high configurations.

5. The paper [5] used multi-colour bands where different coloured bands performed different mouse operations. The main agenda of mouse operations was the number of colours used. Basically it was not the gesture that performed the action or mouse operation. It was completely dependent on the colours of the band used.

6. This paper [6] tried to overcome all the above mentioned problems. They tried to eradicate the colour based detection with contours based detection. Which is purely depended on the angle between the fingers to detect a mouse operation. But the limitation that it faced was, it was dramatically slower in operations.

7. In paper [7] the operation was again based on the colour detection. It again used multi-coloured bands to recognise the image and worked only under the static background. This system had a very few mouse actions and worked only under the static background. It was not dynamic and there was no efficient background subtraction followed in this system.

4. Applications

This virtual mouse operation can be used in fields of augmented reality, computer animations and graphics, video gaming and even in virtual reality and mostly in biomedical instruments. The major application of the system is in the field of robotics that is robot controlling. Various games based on virtual reality and augmented reality. And also for patients without limb control it is

very useful. Deaf and dumb who are capable of sign language can get huge usage of this system

5. Results

To reduce HCI a proposed system where operation of mouse takes place based on hand gesture. The various mouse operation events takes place such as cursor movements, left click, right click and drag.

In this paper the user is allowed to select the color of detection by setting the range of the color using calibrate color system the user can also use default colors that is being defined those are yellow red and blue. Once the color calibrate is done he can switch on the mouse Simulation operation and perform various mouse operations that is required and then click escape to exit from the virtual mouse simulation.

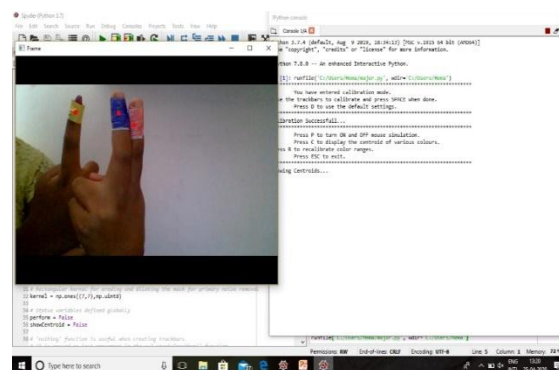


Figure 5: Right Click

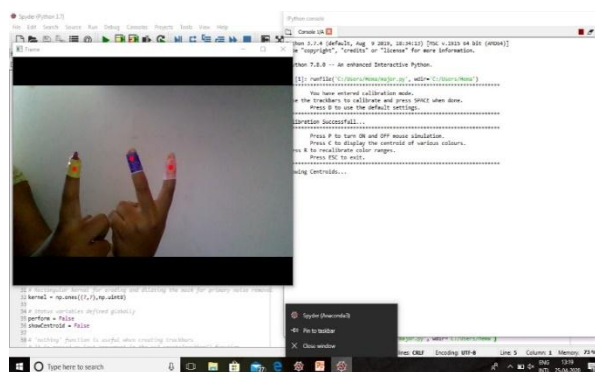


Figure 6: Left Click

6. Conclusion

The virtual mouse operation system based on hand gesture is a guide to control the mouse cursor and to execute real-time tasks. And the mouse operations that is being implemented in this project are right click, left click and drag. This system is based on color detection and different gestures of the hand. The working of this system takes place effectively only in white background and effective light. This algorithm has much effect on mouse operation compared to previous experiments

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