Mouse Control Using Image Processing

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Abstract:

There are many devices present which help to interact with the computer like a mouse, keyboard, and mice. Those devices also called as Human Computer Interaction (HCI) device. Our main intention is to develop Human Computer Interaction device to use efficiently .Where we have tried to control mouse event like left click, right click and moving pointer position using the color detection. The color detection is done using the web camera.

Keywords: Human Computer Interaction (HCI), Color Detection, Web Camera, Mouse Control, C++

1. Introduction

The technology is growing up the scope of Human Computer Interaction is increasing. We used mouse, keyboard, trackpad, joysticks to communicate with the computer. Nowadays, they have used a wireless devices example wireless mouse or wireless keyboard. One disadvantage of these devices is required Bluetooth hardware attached with computer and respective software device also. The new technology touch screen comes in the market which is used in HCI (Human Computer interaction) [1] but a cost of a touch screen is not cheap. That's why we cannot use this technology everywhere.

The proposed system has no such disadvantage. In this System, we go through three phases. Object Detection, Image Processing and Call Event. Our main aim is to control the mouse event like mouse pointer move, left click and right click without any hardware use such as a mouse or wireless mouse. No extra hardware is required other than webcam which is connected with laptop or computer.

COMPONENTS

The components which are mentioned below this not be specific. We also can change it as per our requirements.

2.1 Web Camera

The camera is compulsory in this project. You can use any camera instead of a web camera. A web camera is used to capture live stream video. Which are helpful to detect color and motion of color based on that action will be taken.

2.2 Color Stripes

The color stripes are decided as per our requirement. This will be detected by the program and action will be taken.

In this project, we used three color stripes.

- Red color is used for change pointer position.
- Green color is used for left click.
- Blue color is used for right click.

2. Platform and Firmware

3.1 Open CV

Open CV (Open Source Computer Vision Library) is an open source library for image processing. Open CV library provides inbuilt function mainly used in real-time image processing. Open CV is written in C and C++ but nowadays it is available in Java, Python, Matlab and other languages. Application developed using Open CV runs on Android, Mac, IOS, Linux and Windows. [2]

3.2 .Net Framework

.Net is a platform which is used to create a standalone application in windows. Visual Studio 2012 and C++ language is used for making this project.

3. Introduction to the System

In our project, we have tried to control mouse event. The mouse event like left click right clicks and change pointer position. As shown in figure 1 we used color strips. Color stripes fitted into the fingers. The web camera of laptop or computer is used to capture real-time video with a fixed fps (frame per second) rate.

The real time video is divided into the frame. At individual frame, we apply an image processing algorithm to find out the color object in that frame. We stored the individual frame in the memory and apply image processing algorithm. Because of that, the live video will not be disturbed. When Color objects is detected particular action will be taken.
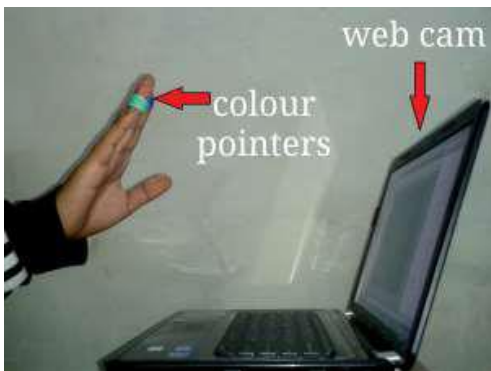
Figure 1: Capturing the video

4. System Development

The basic algorithm of system as below

- Capture real-time video using camera

- Process the distinct image frame

- Flipping of every individual frame

- Convert every frame into grayscale (HSV color)

- Detect color from the grayscale image

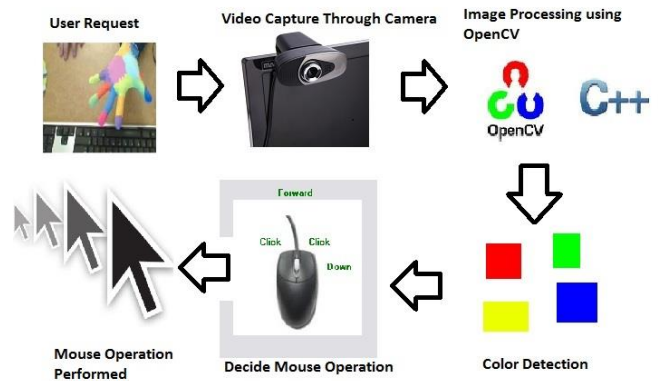- Perform mouse event based on color detection

5.1 Basic Block Diagram

Figure 1: Basic Data Flow Diagram.

5.2 Capturing video and processing individual frame

The capturing of the video is done by the web camera with constant fps (Frame per Second) rate. The frame rate is changed as per requirement. Figure 2 shows that capturing the real-time video.

The Connectivity of a camera with a system is done using the Video capture class provided by Open CV itself. When a camera is connected with the system, Video is captured using read function. [3]

videoCature object_name (int device);

The device means it is an index of a camera to be used. You can use more than one camera to specifying number in the constructor. [3], [4]

Object_name.read();

The read function is used read the individual frame from the video. [4]

Figure 2: Implementation of capturing real-time video

5.3 Flipping and conversion of individual frame

To remove mirror effect of a camera we process flipping of frame. Mirror effect is nothing but inverted of an image. It is exactly same as an image obtained when we stand in front of a mirror.

Flip(original_image,destination_image,index);

A flip function is a defined for the flipping of frame it takes three parameters. The first and second parameter is original image and destination image respectively. The index is specified image inversion direction about the x-axis, y-axis and both. [3]
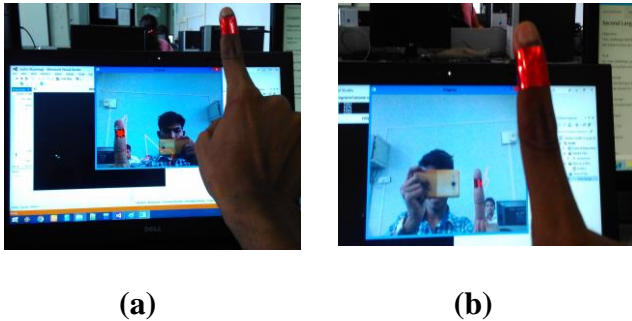

(a)　　　　　　　　**(b)**

Figure 3: (a) Image before flipping. (b) Image after flipping.

We did conversion of RGB (Red Green Blue) image into HSV (Hue Saturation Value) image. In HSV when we adjusting a saturation value, he done without changes the brightness of an image. [5] We perform color detection operation on conversion image frame.

5.4 Color Detection and Noise Reeducation

Color Detection is the main intention and most important step in this project. We detect the red, green and blue color applying algorithm of background subtraction.

If color is detected we required reducing the noise from it.

If noise is present in the image color detection affected and it may detect the wrong object of color. To remove noise from an image we apply two morphological operations, erosion, and dilation. [6]
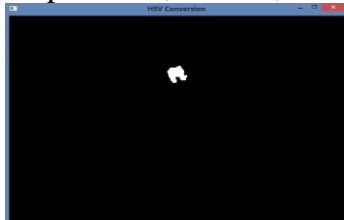

Figure 4: Color detection after image conversion in HSV

5.5　Finding Central of an Object

To control the mouse pointer important thing is coordinates. Finding the coordinates is a challenging work in this project. Based on coordinates we can decide the where we move the mouse pointer.

An inbuilt class moment in OpenCV is used to find out centroid of color object. These coordinates are changes every time when a color object is moved. [3]

5.6　Perform Mouse Event

Once the coordinate finds out, we ready to perform mouse event. The object is not present in fixed positions so every time coordinates are changed. Based on which color is detected, mouse event will perform. A camera has fixed view area. When a user moves hand across the area. The pointer of a mouse will move the same direction of hand direction.

To perform mouse event we used predefine function mouse_event() declared in windows.h header file.

mouse_event(specific_event,x,y);

We required passing x and y coordinate to function. X and y is the coordinate where to move the mouse pointer. [7-9]
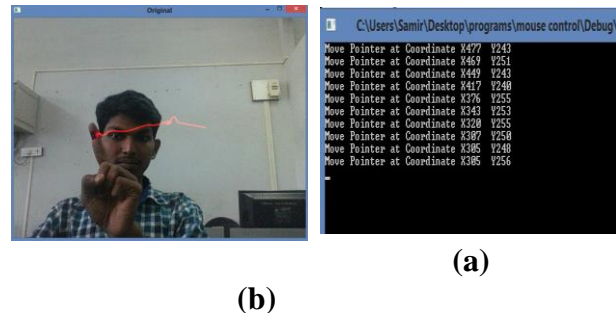

(a)

(b)

Figure 5: (a) When red color moments happened. (b) Activity window shows mouse pointer position when coordinate change and mouse pointer change position.
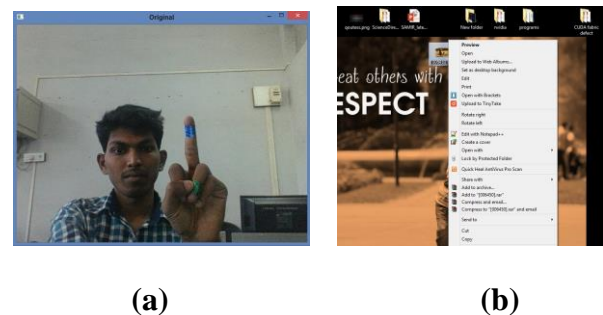

(a)　　　　　　　　**(b)**

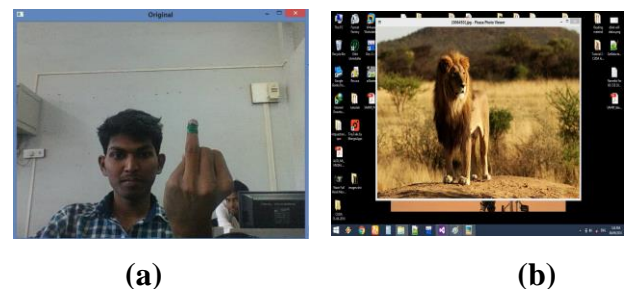**Figure 5:** (a) When blue color is show to web camera.　　(b) Right click will happen.

(a)　　　　　　　　**(b)**

Figure 6: (a) When green color is show to web

camera.   (b) Left click will happen.

Figure 7: Activity window shows the all the activity happened until system will run.

5. Conclusion

In this paper, Mouse control using image processing has been developed with the help of web camera. The System has been implemented in C++ language with the help of OpenCV library files. Most of the system required additional hardware but this system doesn't require any hardware. This is the main advantage of a system.

The proposed system will change the thought of people about regular Human-computer interaction devices. This project completely removes all the hardware required for interaction with the system. This technology has wide scope in the future in various filed. This system can be used in computer graphics, virtual gaming, and six sense technology.

The main intention to create this technology provides the cheapest system which works fine in a standardized operating system and easy to use.

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