Vision Based Mouse Control System using different Colour Coding

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ABSTRACT

In this project, Human computer Interaction approach (HCI) is done, where we are trying to control the movement of mouse cursor and its click events using hand gestures with different colors. Hand gestures were acquired using a camera based on color detection technique. This method is mainly focused on the use of Web Camera to develop the visual based interaction between a computer and human in a cost-efficient manner. These day's intelligent machine are being developed which can be used along with the computer and helps in friendly Human Computer Interaction (HCI). In the previous year's many technologies are used for developing the virtual mouse. In this project, we have tried to provide an upgraded technology for the virtual mouse. To work with a computer mouse and Keyboard are the very essential input devices. To solve this problem virtual keyboard and mouse is developed.

Keywords: Human Computer Interaction, Colour Detection, Web camera

I. INTRODUCTION

In today's technological era, many technologies are being evolved day by day. One such famous technology is Human- Machine Interface. For example, in a wired mouse, the limit is fixed. In wireless mouse, there should have a Bluetooth hardware installed in the system and dedicated Bluetooth attached. This project will have no such limitations and will instead depend on gesture recognition. In this project, there are three technologies mainly used: object detection, image processing and colour recognition using "Sixth sense technology". This Sixth sense technology is a set of wearable devices (like gloves) that acts as a gestural interface between the physical and digital world.The main aim is to move the mouse cursor on the screen without using hardware such as a mouse and only by moving the cursor through finger movements i.e. the process of gesture recognition.

Human Computer Interaction (HCI) today greatly emphasizes on developing more spontaneous and natural interfaces. The Graphical User Interface (GUI) on Personal Computers (PCs) is quite developed, well defined and provides an efficient interface for a user to interact with the computer and access the various applications effortlessly with the help of mice, track pad, etc. In the present day most of the mobile phones are using touch screen technology to interact with the user. This technology can be more efficient but expensive also. But this technology is still not bad to be used in desktops and laptops and have only one requirement which is a web cam. Our objective is to create a virtual mouse system using Web camera which is used to interact with the computer in a very

user-friendly manner that can be an alternative approach for the touch screen.

For the Virtual mouse, mostly uses web camera works with the help of different image processing techniques in which pointer has been used for the object recognition and tracking. Left click, right click, and other events of the mouse have been achieved by detecting the number and the colour code of pointers on the images.

II. SYSTEM OVERVIEW

In this work, we are trying to control mouse cursor movement and mouse events on a laptop and computers using a camera based on colour detection technique. Real time images have been captured using a Web-Camera. The user wears wearable devices (like gloves) to provide information to the system. Every frames of the video is separately processed. The processing techniques involve an image subtraction algorithm to detect colours. Once the colours are detected the system performs various operations to track the cursor and performs control actions, the details of which are provided below. No additional hardware is required by the system other than the standard webcam which is provided in every laptop computer.

III. IMPLEMENTATION

The process of taking input from web cam and performing an action to the cursor involves several steps. First it captures the real time video using web cam. After this, Processing on the individual image frame. Conversion of each frame to gray scale is done after this step. Color detection and extraction of the different colors (RGB) from gray scale image is done and image is converted into binary image. The region of the image and its centroid is calculated and mouse pointer is tracked using the coordinates obtained from the centroid.

- **Real time video capturing:**
  For the system to work, we need a sensor to detect the movement of hand and of the user. The webcam of the computer is used as a sensor and a glove with different color is used to move cursor. The webcam captures the real time video of fixed fps and resolution which is depends on the hardware of the camera. The frame rate and resolution can be changed in the system if required.

- Computer Webcam is used to capture the Real Time Video.
- Video is divided into Image frames base on the FPS value of camera.
- Processing of individual Frames.

- **Conversion of Image into Gray scale Image:**
  Computational complexity is reduced in a gray scale image as compared to a colored image. Thus the image is converted into a gray scale image. All the necessary operations were performed after converting the image into gray scale. Every frame is converted into grayscale and then other operations are done.

- **Color Detection:**
  This is the most important step in the whole process. The red, green and blue color object is detected by subtracting the color suppressed channel from the Gray-Scale Image. This creates an image which contains the detected object as a patch of grey surrounded by black space.

- **Conversion of gray scale Image into Binary scale Image**

The grey region of the image obtained after subtraction needs to be converted to a binary image for finding the region of the detected object. A grayscale image consists of a matrix containing the values of each pixel. The pixel values lay between the ranges 0 to 255 where 0 represents pure black and 255 represents pure white color.

- **Finding Centroid of an object and plotting:**

For the user to control the mouse pointer it is necessary to determine a point whose coordinates can be sent to the cursor. With these coordinates, the system can control the cursor movement. An inbuilt function in MATLAB is used to find the centroid of the detected region. The output of function is a matrix consisting of the X (horizontal) and Y (vertical) coordinates of the centroid. These coordinates change with time as the object moves across the screen.

- **Tracking the Mouse pointer:**

Once the coordinates has been determined, the mouse driver is accessed and the coordinates are sent to the cursor. With these coordinates, the cursor places itself in the required position. It is assumed that the object moves continuously, each time a new centroid is determined and for each frame the cursor obtains a new position, thus creating an effect of tracking. So as the user moves his hands across the field of view of the camera, the mouse moves proportionally across the screen.

- **Performing Clicking action:**

The control actions of the mouse are performed by controlling the flags associated with the mouse buttons. JAVA robot class is used to access these flags. The user has to perform hand gestures in order to create the control actions. Due to the use of color pointers, the computation time required is reduced. Furthermore, the system becomes resistant to background noise and low illumination conditions.
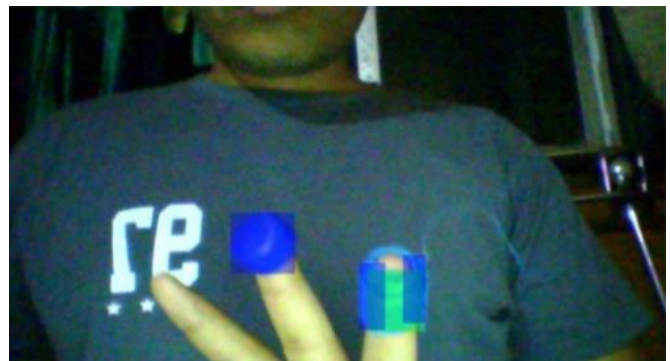
IV. RESULTS AND DISCUSSION

a) Movement of cursor:

b)Left click event:

c) Right click event:

d) Double click event:

e) Cursor Scroll event:

V. CONCLUSION

The system architecture that has been proposed will completely change the way people would use the Computer system. Presently, the webcam, microphone and mouse are an integral part of the Computer system. This project will completely eliminate the necessity of mouse. Also this would lead to a new era of Human Computer Interaction (HCI) where no physical contact with the device is required. The use of object detection and image processing in MATLAB for the implementation of our proposed work proved to be practically successful and the movement of mouse cursor is achieved with a good precision accuracy. This technology can be used to help patients who don't have control of their limbs. In case of computer graphics and gaming this technology has been applied in modern

gaming consoles to create interactive games where a person's motions are tracked and interpreted as commands. Most of the applications require additional hardware which is often very costly. The motive was to create this technology in the cheapest possible way and also to create it under a standardized operating system. Various application programs can be written exclusively for this technology to create a wide range of applications with the minimum requirement of resources.

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