

# Virtual Mouse

Pranoti Vaidya<sup>1</sup>, Pooja pangavhane<sup>2</sup>, Jyoti Deore<sup>3</sup>, Rakhi Thakare<sup>4</sup>

Computer, L.G.N. Sapkal COE, Nasik, India<sup>1,2,3,4</sup>

**Abstract:** Nowadays most of the mobile devices are using a touch screen technology. However, this technology is still not cheap enough to be used in desktop systems. Creating a virtual human computer interaction device such as mouse using a webcam and computer vision techniques can be an alternative way for the touch screen. In this study, finger tracking based a virtual mouse application has been designed and implemented using a regular webcam. The motivation was to create an object tracking application to interact with the computer, and develop a virtual human computer interaction device.

**Keywords:** Click event web camera, colour events, HCI, Ubiquitous Computing, Background Subtraction, Skin Detection, HSV Colour Model.

## I. INTRODUCTION

One of the important challenges in Human Computer Interactions is to develop more intuitive and more natural interfaces. Computing environments presently are strongly tied to the availability of a high resolution pointing device with a single, discrete two dimensional cursor. Modern Graphical user interface (GUI), which is a current standard interface on personal computers (PCs), is well-defined, and it provides an efficient interface for a user to use various applications on a computer. GUIs (graphical user interfaces) combined with devices such as mice and track Pads are extremely effective at reducing the richness and variety of human communication down to a single point. To control mouse cursor movement and click events using a camera based on colour detection technique. Here real time video has been captured using a Web Camera. The user wears colour tapes to provide information to the system. Individual frames of the video are 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. In this study, a colour pointer has been used for the object recognition and tracking. Left and the right click events of the mouse have been achieved by detecting the number of pointers on the image. There is need of easy to carry mouse with minimum hardware cost.

## II. RELATED WORK

A lot of research is being done in the fields of Human Computer Interaction (HCI) and Robotics. Researchers have tried to control mouse movement using video devices for HCI. However, all of them used different methods to make mouse cursor movement and clicking events. One approach, used index finger for cursor movement and angle between index finger and thumb for clicking, used finger tip tracking to control the motion of the mouse. A click of the mouse button was implemented by defining a screen such that a click occurred when a user's hand passed over the region [1]. Another one is only the finger-

tips to control the mouse cursor and click. Clicking method was based on image density, and required the user to hold the mouse cursor on the desired spot for a short period of time [2]. Another method to click is the motion of the thumb (from a 'thumbs-up' position to a fist) to mark a clicking event thumb. Movement of the hand while making a special hand sign moved the mouse pointer [3]. One more method is Real-time system that can track the 3D position and 2D orientation of the thumb and index finger of each hand without the use of special markers or gloves. System could be used for single pointing and pinching gestures [4]. Another is a finger counting system to control behaviour of a robot. A study of the existing systems for on-screen choice selection reveals that people are still limited to the use of devices such as mouse, touchpad, joystick, trackball and touch screen. All these devices need contact of hand with them [5].

## III. SYSTEM ARCHITECTURE

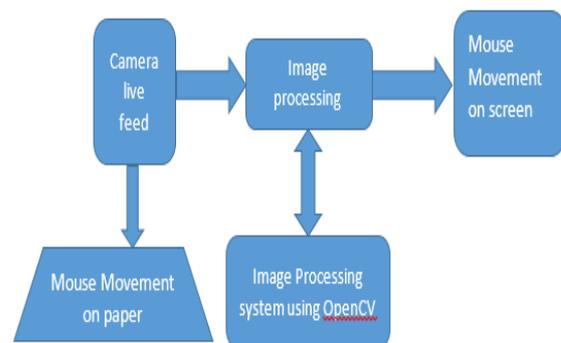


Fig1. System architecture

In the object tracking application one of the main problems is object detection. Instead of finger tips, a colour pointer has been used to make the object detection easy and fast. A circle blue sticker is used as a colour pointer in this study. To simulate the click events of the mouse three fingers with three colour pointers has been used

**FUNCTIONS USED IN VIRTUAL MOUSE ARE AS FOLLOW:**

**BLOB ANALYSIS:** Blob Analysis is a fundamental technique of machine vision based on analysis of consistent image regions. As such it is a tool of choice for applications in which the objects being inspected are clearly discernible from the background.

**HSV MODEL: SKIN COLOR DETECTION** HSL stands for hue, saturation, and lightness, and is often also called HLS. HSV stands for hue, saturation, and value, and is also often called HSB (B for brightness). A third model, common in computer vision applications, is HSI, for hue, saturation, and intensity.

**DETECTING BACKGROUND:** After giving the feed from camera. 1st thing to do is to remove the background. We use running average over a sequence of images to get the average image which will be the background too.

**BACKGROUND SUBTRACTION:** Background subtraction involves calculating a reference image, subtracting each new frame from this image and thresholding the result which results is a binary segmentation of the image which highlights regions of non-stationary objects.

**CONTOUR EXTRACTION:** Contour extraction is performed using Open CV's inbuilt edge extraction function. It uses a canny filter. You can tweak parameters to get better edge detection.

**CONVEX HULL AND DEFECTS:** Convex hull points are most likely to be on the fingers as they are the extremities and hence this fact can be used to detect no of fingers. We are finding the deepest point of deviation on the contour.

**TRACKING AND FINGER DETECTION:** Tracking and counting the no of finger.

**GESTURE RECOGNITION:** Click gesture – Single click, Double click, Left Click, Right Click, Drag Drop gesture, Scroll up, Scroll Down, MOUSE

**KEYSTROKE** Send the keystroke to operating system.

**Methodologies of Problem solving and efficiency issue**

Colour Detection:

- 1) To detect the blue color of the pointer, built in "imsubtract" function has been used.
- 2) Imsubtract function can be used as.  
 $Z = \text{imsubtract}(X, Y)$
- 3) It subtracts each element in array Y from the corresponding element in array X and returns the difference in the corresponding element of the output array Z.
- 4) X and Y are real, non-sparse numeric arrays of the same size and class, or Y is a double scalar.

- 5) The array returned, Z, has the same size and class as X unless X is logical, in which case Z is double



Figure2. (a) Input image, (b) after using imsubtract and detect the blue color

**Algorithm and Scope**

**Input:**

Finger tracking based a virtual mouse application has been designed and implemented using a regular webcam. The motivation was to create an object tracking application to interact with the computer, and develop a virtual human computer interaction device

**Algorithm**

1. Set a pointer in the image
2. Detect the pointer using the defined color information
3. Define the region and the center of the pointer and draw a bounding box around it
4. Track the motion of the pointer
5. Move the cursor according to the position of the center of the pointer
6. Simulate the single and the double left click and the right click of the mouse.

**Scope**

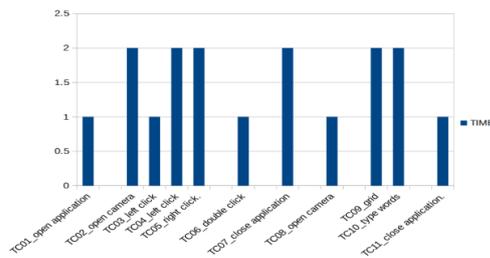
To develop control mouse cursor movement and click events using a camera based on color detection technique. Real time video has been captured using a Web Camera In this study, a color pointer has been used for the object recognition and tracking. Left and the right click events of the mouse have been achieved by detecting the number of pointers on the image In this system, we have proposed to use color tapes on the fingers and all other functions can be done considering the relative distance of the tapes and the waiting time.

This method has a greater efficiency over all other methods used earlier in this regard, where bare finger tips are used. Finger tip detection algorithms are not much effective as the color of the tip of the finger cannot be differentiated from the color of hand. This requires use of complex algorithms.

To avoid such complex algorithms and make our system quick enough for real time computation, we have proposed use of color tapes on the finger tips. This completely distinguishes the finger tip from the rest part of the hand.

This distinction makes the color detection algorithm detect the tip quite easily and map it for cursor movement. Thus, the complexity of computation is reduced and overall results are improved.

#### IV. RESULT ANALYSIS



**Rakhi S. Thakare**, Department of Computer Engineering, Lt. G.N.Sapkal College of Engineering, Nashik, Savitribai Phule Pune University, India

#### V. CONCLUSION

This paper represents concept of image processing which is having wider scope in recent years .We are presenting the concept of virtual mouse . In this study, an object tracking based virtual mouse application has been developed and implemented using a webcam. Virtual mouse is capable of performing ac-curate control of remote display and simulating mouse.

#### ACKNOWLEDGMENT

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#### BIOGRAPHIES



**Pranoti R. Vaidya**, Department of Computer Engineering, Lt. G.N.Sapkal College of Engineering, Nashik, Savitribai Phule Pune University, India



**Pooja pangavhane**, Department of Computer Engineering, Lt. G.N.Sapkal College of Engineering, Nashik, Savitribai Phule Pune University, India



**Jyoti K. Deore**, Department of Computer Engineering, Lt. G.N.Sapkal College of Engineering, Nashik, Savitribai Phule Pune University, India