# Human Computer Interactive Virtual Mouse using Finger Detection

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*Abstract—* The computer technology is being changing day by day, the importance of human and computer interaction (HCI) is quickly increasing. Nowadays touch-screen technology is famous. However, this technology is costly to be used in PC. Creating a virtual human computer interaction device such as pointing device like mouse, input using a webcam and computer vision techniques can be the another way for the touch screen technology. An important application of this system is to simulate mouse as a visual inputting device. This paper presents a vision based virtual mouse interface using a single web camera. In this cram, finger tracking based, a virtual mouse application has been designed and implemented using a regular web camera. The idea was to create an object tracking application to interact with the computer system, and develop a virtual human computer interaction device.

*Key words:* Computer vision, Tracking, Human computer interaction (HCI), Image acquisition, Object recognition, Virtual mouse, Finger detection etc

## I. INTRODUCTION

In computing, a mouse serves as a pointing device that detects 2D motion relative to a surface. This motion is typically translated into the motion of a pointer on a display screen, which allows for fine control of a graphical user interface (GUI). There is a need for new interfaces. Touch screens are also a good control interface and nowadays it is used globally in many applications.

In interactive 3D graphics, the mouse's motion often translates directly into changes in the virtual objects' or camera's orientation. However, touch screens cannot be applied to desktop systems because of cost and other hardware limitations. By applying computer vision technology and controlling the mouse by fingertip on virtual panel we can achieve accurate and effective interaction with computer even at larger distances away from camera depending on the quality of the web camera. It is very attractive to utilize hand gesture as a kind of "mouse" using only visual information. One obvious difficulty is that hand is complex and highly flexible structure. Tracking and recognizing hand motion is the basic techniques needed for this task.

## II. OVERVIEW

The system setup mainly involves a camera of the laptop or external web camera for desktop system. The user of the system need to take a seat in front of the screen with colour stickers mounted on the fingers. The system architecture is as shown in fig. (a). Current system implements pressing/clicking events by holding a particular gesture for a while which is recognizes using gesture recognition module.
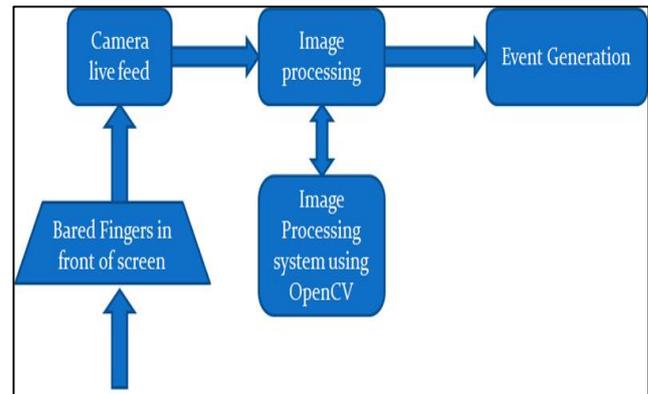


Fig. 1: System Architecture

## III. LITERATURE SURVEY

In first paper [1], the researchers have proposed a system which enables users to interact with the machine which works efficiently as that of the existing systems of computer vision.

In second paper [2], the researchers have simulated the mouse operations using two colour tapes.

In third paper [3], the researchers have proposed a system which enables users to interact with the machine using a finger tracking mechanism.

## IV. IMAGE AQUISITION

It is simply defined as retrieving an image. It always serves as a first step in image processing because without an image, image processing cannot be done. For the acquisition of image by the system's camera, client need to take a seat in front of the screen.

## V. GESTURE RECOGNITION

By means of mathematical algorithms human gestures can be recognized/interpreted using gesture recognition. From any bodily motion gestures can be originated but commonly originated from the face or hand. Gesture recognition allows humans to interact with the machine without any mechanical devices. For computers to begin to understand human body language, gesture recognition can be a way.

Virtual mouse can be used for mouse events like 1.Right Click, 2.Left Click, 3.Double Click etc. The application detects the hand movements given by user and performs operation accordingly. User can perform various tasks with his gestures. No extra hardware will be required except a webcam. Hence the system is less prone to any physical damage. Here, we are directly using the fingers with color stickers hence there is certain degree of fun in the whole idea.

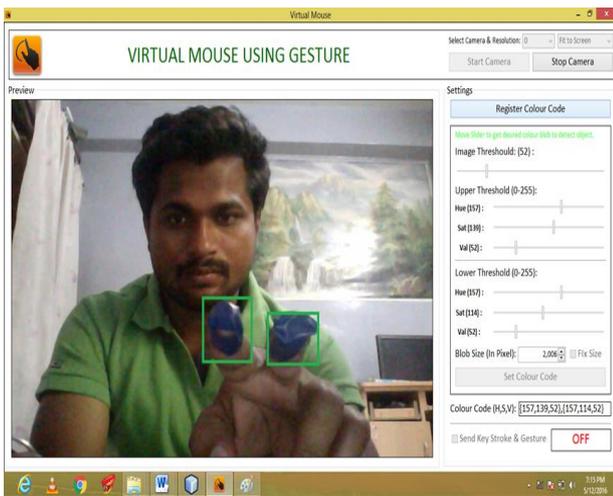## VI. OBJECT TRACING & INFORMATION RETRIEVAL METHOD



Fig. 2: Object tracing and Information Retrieval Method.

Object Tracing and information retrieval method using finger detection is shown in Fig 2. Here, the bounding box is detected which is used for the next step which is used for point coordinate calculation.

## VII. POINT COORDINATE CALCULATION AND MOTION ANALYSIS
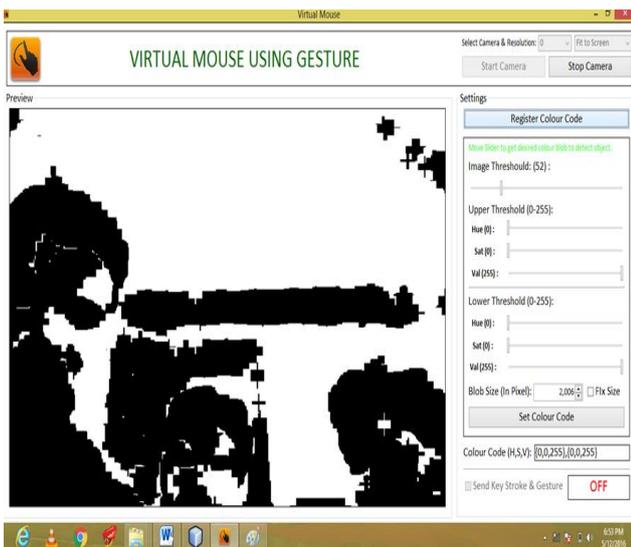


Fig. 3: Point coordinate calculation and motion analysis

After object tracing, point coordinate calculation and motion analysis is done. The Fig 3. Shows point coordinate calculation and motion analysis. After this, event generation is performed.
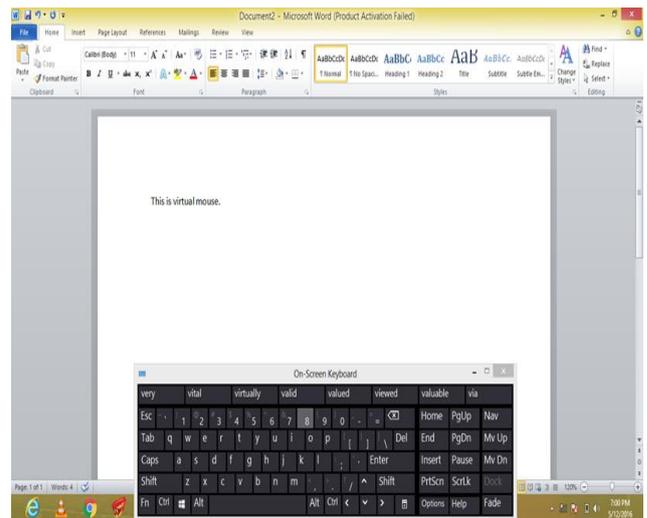
## VIII. EVENT GENERATION



Fig. 4: Event generation

The final step is shown in Fig 4. Where the event generation is done. Here, the mouse click events are performed such as single click, double click etc.

## IX. FUTURE SCOPE

– Lot of research is going in the field of gesture recognition.
– For the future works, instead of colour stickers directly finger tips can be detected.

## X. CONCLUSION

The proposed method presents a vision based application for virtual mouse interface using fingertip. The system is to be implemented in OpenCV (Open Source Computer Vision) environment. As an object, three different colour stickers (Red, Blue, Green) are used to make the detection easy and fast. Object detection and motion tracking works very well. This system is based on the Computer Vision Algorithm and can do all mouse tasks.

### REFERENCES

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