

# Real Time Hand Gesture Mouse

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**Abstract:** In this modern world, many technologies are evolving day by day. One such promising concept is Human- Machine Interface. For example, in a wired mouse there is no provision to extend limit. In wireless mouse, one should have Bluetooth hardware installed in the computer and Bluetooth dongle attached. Real Time Hand Gesture Control Mouse will have no such limitations and will instead depend on gesture recognition. In this, three technologies are mainly used: object detection, image processing and color recognition. Gesture recognition is creation of a system that can identify specific human hand gestures and use them to convey information or for device control as well as applications control. Hand Gesture Recognition System is a branch of Human Computer Interaction in which Human hand gestures are recognized by the computer system and then perform predefined task as per the application for controlling software as well as hardware. The 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.

**Index Terms – Object Detection, Image Processing, Color Recognition.**

## I. INTRODUCTION

Human computer interaction (HCI) is a growing field in which computer scientists study novel ways in which humans can interact with computers naturally and intuitively. One of the most widely researched topics in this field is hand gesture recognition, where hand movements are used to control computers. The key problem in gesture interaction is how to make hand gestures understood by computers. The approaches present can be mainly divided into Data-Glove based and Vision Based approaches. The Data-Glove based methods use sensor devices for digitizing hand and finger motions into multi-parametric data. The extra sensors make it easy to collect hand configuration and movement. However, the devices are quite expensive and bring much cumbersome experience to the users. In contrast, the Vision Based methods require only a camera, thus realizing a natural interaction between humans and computers without the use of any extra devices. These systems tend to complement biological vision by describing artificial vision systems that are implemented mostly in software. This approach is the cheapest, and the most lightweight. Moreover, such systems must be optimized to meet the requirements, including accuracy and robustness.

## II. PURPOSE

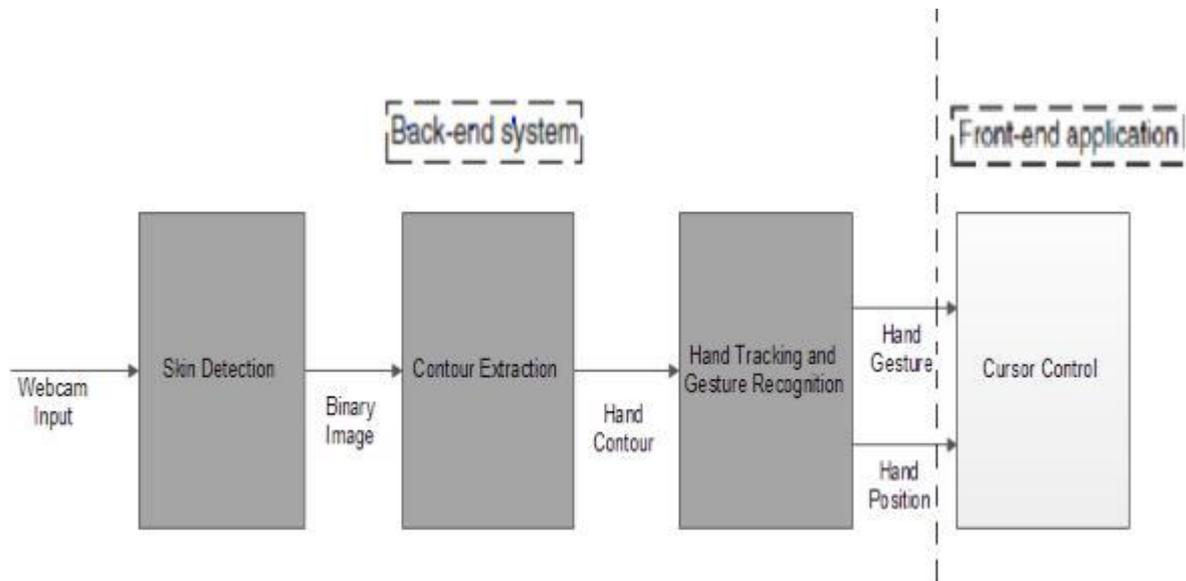
This application is mainly developed for physically disabled people. By using voice and camera, mouse cursor will move. So they don't require too much energy and user won't get tired from using this device. Using this system, persons who can no longer use their hands and even patients who are paralyzed from shoulder downwards can use computer, communication, environmental control, source of information and entertainment

## III. SCOPE

This application would allow the user to control the cursor of computer using only their bare hand, without the need for any additional hardware or gloves. This is done using vision based hand gesture recognition with inputs from a webcam. There are other cursor control application using hand gesture, but they often require the user to wear a bulky data glove (Quam 1990). This hinders the ease of control and makes some gestures difficult to perform. Most laptops today have a built in webcam, which are mainly used for video conferencing. This application will greatly extend the use of a webcam to cursor control, which can actually eliminate the need for a computer mouse. Human Computer Interaction using hand gestures is very intuitive and effective for one to one interaction with computers and it provides a Natural User Interface (NUI).

## IV. ARCHITECTURE OF SYSTEM

In this project mouse cursor movement and click events are controlled using a camera based on color detection technique. Here real time video has been captured using a Web Camera. Individual frames of the video are separately processed. Additional hardware like mica, a minimum of Intel i3 processor is required by the system other than the standard webcam which is provided in every laptop computer. The steps involved in the back-end system as shown in Figure: 1 are similar for most vision based, marker less hand gesture recognition system. The outputs of the back-end system are the hand gesture and the hand position. Although the front-end application for this project is cursor control, there are many different front end applications that can be used with the back-end system, such as sign language recognition



**Figure 1: Architecture of the system**

#### IV. WORKING

There are generally two approaches for hand gesture recognition, which are hardware based, where the user must wear a device, and the other is vision based, which uses image processing techniques with inputs from a camera. The proposed system is vision based, which uses image processing techniques and inputs from a computer webcam. Vision based gesture recognition systems are generally broken down into four stages, skin detection, hand contour extraction, hand tracking and gesture recognition. The input frame would be captured from the webcam and the skin region would be detected using skin detection. The hand contour would then be found and used for hand tracking and gesture recognition. Hand tracking would be used to navigate the computer cursor and hand gestures would be used to perform mouse functions such as left click, scroll up and scroll down. The scope of the project would therefore be to design a vision based cursor control system, which can perform the mouse as function previously stated.

##### *Skin Detection*

Skin detection can be defined as detecting the skin color pixels in an image. It is a fundamental step a wide range of image processing application such as face detection, hand tracking and hand gesture recognition. Skin detection using color information has recently gained a lot of attention, since it is computationally effective and provides robust information against scaling, rotation and partial occlusion. Skin detection using color information can be a challenging task, since skin appearance in images is affected by illumination, camera characteristics, background and quality. So as to cut back the results of illumination, The input image from the camera would be in the RGB color space, thus it would have to be converted to the YCbCr color space using the conversion

##### *Hand Contour Extraction*

After getting the skin segmented binary image, following step is to perform edge detection to get the hand contour within the image. An edge detection technique is used to search out the contours within the image. The main advantage of the border finding edge detection technique is that each one the contours found within the image is keep in an array. This implies that we are able to analyze every contour within the image individually, to determine the hand contour.

##### *Center Of Contour*

Finally, we try to find the center of our contour using moments of contour. As soon as we are able to get the coordinates of the center. We noticed there was too much fluctuations in the center of contour, as the hand continuously flickered. for this problem we divided the co ordinates of center by 10 to remove the unit part of them as there was no fluctuation in the tenths of the co ordinates

##### *Speech Recognition*

In .net Client side application part, inputted command will be extracted from the voice as text. Then compare the commands with database and execute the commands. i.e., when the user input the LEFT command the mouse cursor will move towards left, while giving UP command mouse cursor will move upwards and so on. Also when the users command is PAINT, the paint application will be opened and when users command is SHUTDOWN, the system will soon undergoes shutdown process. Likewise, we can execute all the commands that are stored in the database. The processing code is divided into three main parts:

Image Filtering to obtain biggest skin colored contour, Finding convexity defects to count number of fingers, for mouse click events and Finding center of palm and do necessary noise itering to move cursor position.

## V. OVERVIEW OF THE SYSTEM

The environmental setup for the system is shown in Figure :2



The users hand should be at least 24cm from the webcam and the room should be well lit. The source of the light in the room must be white, since the appearance of skin changes under different colors of light. The webcam must not be moving and if it is shifted the program should be restarted. In Figure: 2 the user is only using one hand to operate the program and the other hand must not be in front of the webcam. The cursor control system consists of two main parts, the back end system and the front end application. In the back end system, image processing techniques are used to allow hand gesture recognition, while the front end Application uses the interpreted hand gestures to allow cursor control.

## V1. FUTURE ADVANCEMENTS

Two-handed 3D: It would be possible to detect the gestures by both hands whilst both are in the frame in 3d (using more than one camera). A method would have to be devised to detect a gesture (or range of gestures) that is represented by a partially occluded hand. This method would be considerably harder to implement. Because we need to process more than one frame at a time from more than one camera- to recognize the gestures. We may use these gestures to apply them on the full American Sign Language.

## V11.RESULT AND DISCUSSION

The goal of this project is to create a system that will recognize the hand gestures and control the computer/laptop according to those gestures. The project will also benefit the mobile systems where using pointing devices like mouse is difficult this technology has wide applications in the fields of augmented reality, computer graphics, computer gaming, prosthetics, and biomedical instrumentation. Furthermore a similar technology can be applied to create applications like a digital canvas which is gaining popularity among artists. 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 motion are tracked and interpreted as commands.

Most of the applications require additional hardware which is often very costly. Our 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.

- This windows application is user-friendly and much interactive. It is very cheap and don't require extra hardware
- It can provide more functions depending on the choice of object.
- Easy to modify and adapt
- Less prone to physical damage, Due to absence of more physical device

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