



## **Gesture and Voice Based PC Control Using Real Time Camera**

Authors

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### **Abstract**

*Human Computer Interaction with hand gesture has become increasingly popular today. The physical mouse device whether it is our basic desktop mouse or laptop touch pad, it require physical contact of user to convey input. Many advanced technologies have come but they all require physical contact. Hence we need a ubiquitous interface to do this. Our method is to use a camera device and computer gesture and voice based technology, like image segmentation as well as gesture recognition, to control mouse actions such as left click, double click, right click and dragging. We can show how it can do the things that present mouse devices can do. Our project Gesture and Voice Based PC Control is a real time system capable of understanding mouse commands given by hand gestures and voice commands. The end user is able to communicate with computer with the commands given by hand gestures and voice commands. This will avoid the need of physical contact to the computer to control mouse inputs. In this way the interface becomes ubiquitous.*

### **Introduction**

As computer technology continues to improve, people are having smaller and smaller electronic devices. They want to use these devices ubiquitously. There is need of a new interfaces designed specifically for use with these electronics devices. We are increasingly recognizing the importance of HCI, and in particularly gesture based gesture recognition. Simple interfaces already exist, such as embedded keyboard, folder keyboard and mini keyboard <sup>[2]</sup>. However, these interfaces need some amount of space to use as well as can't be used in motion. Touch screens devices are also providing a good control interface and nowadays it is used globally in many applications <sup>[3]</sup>. But the cost and other hardware limitations makes it limited. With application of gesture technology and controlling the mouse actions by natural hand gestures, we can reduce the space required. We propose a good approach that uses a camera to control the mouse actions.

### **Problem Definition**

To develop a software solution to a problem, the first step is to understand the problem.

Mouse is a physical device, subject to mechanical wear and tear also demands the user to make physical contact to convey his Input, which is no longer appropriate. Natural actions in human to human communication, such as speak and gesture, seem more appropriate. Interfaces based on computational perception and computer gesture should be available for accomplishing the goals of ubiquitous computing <sup>[5]</sup>. The problem here is to develop a way so that humans can interact with a computer without having any physical contact with the computer.

### **Need for the New System**

Mouse is a physical device. This device is subject to mechanical wear and tear. It requires the user to make physical contact to convey his Input, which is not appropriate. Instead, natural actions in human-to-human communication, such as speak and gesture, seem more appropriate <sup>[5]</sup>. This

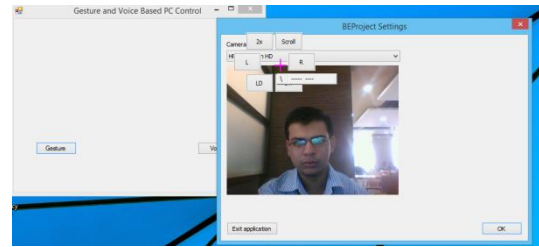
Interaction implies that it should not be necessary to carry any equipment or to be in a specific location [3]. Interfaces based on computational perception and computer gesture should be appropriate for accomplishing the goals of today's ubiquitous computing.

### Requirement Analysis

This is the process of gathering information about the current system, identifying its strengths and problems, and analysing them to produce a concept for the new system [5]. It is the detailed appraisal of the existing system. The goal of this analysis stage is to truly understand the requirements for the new system and develop a system concept that addresses them. The analysis that will be done would be on how a current system works and the new requirement to improve the timetable system [5]. During this phase the current system is subjected to a thorough examination with the intent of finding its drawbacks and thereby improving it through better procedures and methods. Any new system or recommendations for change in the existing system must lead to improvement. At present there is need of a system that uses computer gesture and hand gesture recognition to control mouse actions because physical mouse requires physical contact of user to convey his inputs. This form of HCI makes user free from physical contact with mouse.

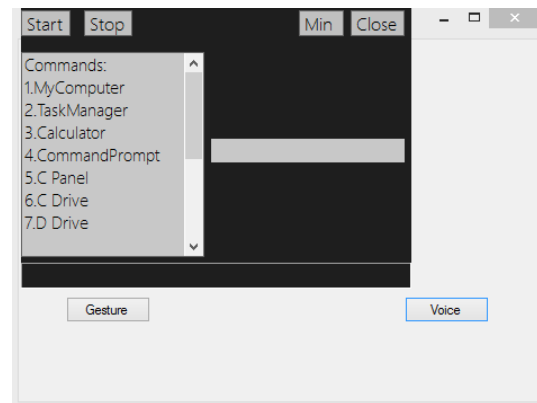
### Hand Gesture Recognition

**Segmentation:-**we have to separate the hand region from background. In natural environment it is difficult to detect skin color because of the illuminations and skin colors. The skin color range should be carefully chosen. For Better results we converted from RGB color to YCbCr color space, because YCbCr is insensitive to color variation [5].



**segmentation**

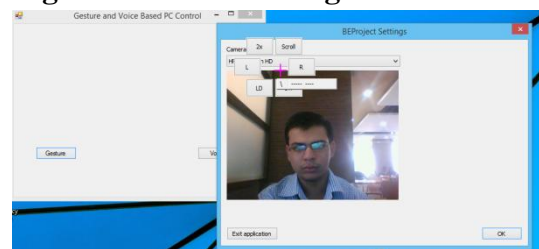
**Deleting noise:** The image contains background noise. To get better result we need to remove the noise pixel from binary image [5]. This is done by using morphology algorithms that apply erosion and dilation for removing noise. Erosion trims down the image area where the hand is not present and Dilation expands the area of the Image pixels which are not eroded.



**With Noise**

**Without Noise**

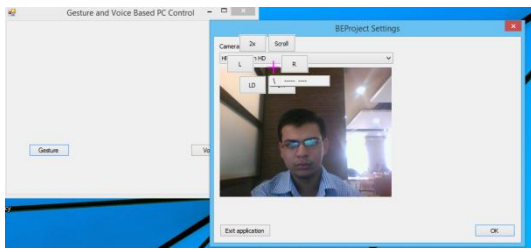
### Finding center and hand region:-



**Hand Center**

**Finding finger tip:-**Once we get the hand region, we can compute fingertips by using convex hull algorithm. We have computed the center of hand region. Convex hull gives set of vertices in hand region [4]. The cv Convexity Defects () gives the convexity defects. Then we can find middle finger by calculating largest distance from center. The finger next to middle finger is index finger. These

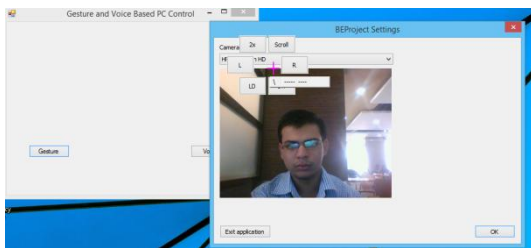
fingertips are the start and end points of corresponding defect.



**Finding Finger Tip**

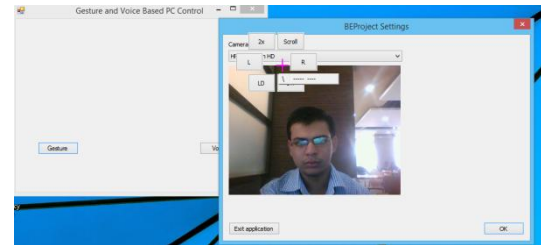
### Controlling Mouse

**Moving Mouse Cursor:-**We used the center point of hand region to move mouse cursor. We mapped this hand region center on screen and according to its position we move the mouse pointer on the screen [4].



**Moving Mouse Cursor**

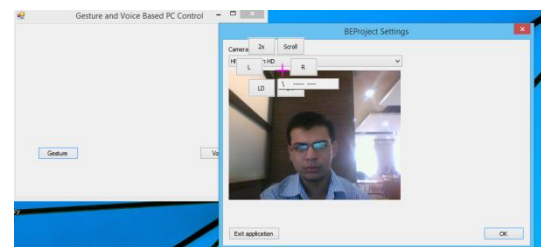
**Left Click, Double click, Right Click:-**we found fingertip from convex hull. After finding convex hull of hand we can find convexity defects. These defect have attributes such as start, depth, and end [4]. Now we can find middle finger as the maximum distance of fingertip from center of hand region. Once we get this defect, the start of this defect is tip of middle finger and end of this defect is tip of index finger. The depth point is the intersection point of these two fingers. When the tip of index finger is below the depth and the tip of middle finger is above depth, this gesture we used for left click [3]. When the same gesture is held for 2 second, we recognize this gesture as double click. This is the way we distinguished between single click and double click. When both middle and index finger tip is below depth point (closed palm), we recognize this gesture as right click [3].



**Left Click, Double click, Right Click (from left)**

### Dragging

When there are only two fingers, then this gesture will send left mouse button down event and when again there is different gesture this will send left mouse button up event. This is the way we implemented dragging.



**Dragging**

### Conclusion

We have developed the system to control the mouse actions with a real time camera. We have implemented all mouse commands like left clicking, double clicking, right clicking and dragging. This system is based on computer gesture technology. This can do all tasks that a mouse can do [2]. Due to light illumination effects this is difficult to maintain stability. Most gesture have illumination issues. Also we can increase the operating distance and accuracy by using a high quality camera. In this way we can have a hand gesture recognition system for controlling mouse tasks that does not require physical contact of user to convey inputs. We can use the same technology to make human computer interaction independent of physical contact with particular computer hardware [4]. We can use more gestures to perform other useful tasks. We can also create gesture based keyboard by recognizing American Sign Language gestures that are based on hand gestures. This can be done by using advance techniques by using classifiers or databases.

## References

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