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# Mouse Control Using Facial Gestures

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**ABSTRACT:** Human-Computer Interface (HCI) is focused on use of computer technology to provide interface between the computer and the human. There is a need for finding the suitable technology that makes the effective communication between human and computer. Human computer interaction plays the important role. Thus, there is a need to find a method that spreads an alternate way for making communication between the human and computer to the individuals. As computer aided learning is growing up, the significance of human-computer interaction is rapidly expanding. Human and computer interconnection has expanded in recent years. Personal and computer computations are a need in the workspace as well as for academic purposes. In the proposed system, we have included the face detection, face tracking, eye detection and interpretation of a sequence of eye blinks in real time for controlling a nonintrusive human computer interface. Conventional method of interaction with the computer with the mouse is replaced with the human eye movements. This technique will help the paralyzed person, physically challenged people especially person without hands to compute efficiently and with the ease of use. A webcam is required to acquire images of facial movements that are recorded by the webcam. The image is preprocessed by flipping and converting into gray scale image. These movements are further graphed to a computer screen to position a mouse cursor accordingly. The movement of the mouse is automatically adjusted by the position of the anchor point. Camera is used to capture the image of face movement. The system would take the real-time video input from the user with the help of OpenCV and run in the background. It is able to perform all mouse controls along with some other keyboard controls.

**KEYWORDS:** PWDs, disabled, facial gestures, opencv, feature extraction, recognition, HOG, HCI, cursor control

## I. INTRODUCTION

As computer aided learning is growing up, the significance of human-computer interaction is rapidly expanding. Human and computer interconnection has expanded in recent years. Personal and computer computations are a need in the workspace as well as for academic purposes. Thus, a vision-based approach is taken into account and an effective technique to develop human-computer interface systems is used. A webcam is required to acquire images of facial movements that are recorded by the webcam. These movements are further graphed to a computer screen to position a mouse cursor accordingly. The movement of the mouse is automatically adjusted by the position of the anchor point. Camera is used to capture the image of face movement. The system would take the real-time video input from the user with the help of OpenCV and run in the background. The input images taken from the user are converted from RGB images to grayscale images; a certain point on the user's face would control the cursor on the screen and the right and left wink would implement the right and left click respectively. Squeezed eyes would facilitate the enabling of the scroll function in case of reading PDFs and other documents. It would thus facilitate the use and movement of the cursor through the face gestures.

## MOTIVATION

The motivation behind this project lies in growing an economically feasible and hardware-independent machine using which humans can control the system without having any bodily reference to the PC. The main aim lies in creating a system that is environment friendly to use and at the same time, it is effortless for handicapped or person with disabilities. It needs to supply flexibility to the person as properly as it needs to no longer be time-consuming.

## II. LITERATURE SURVEY

Many researchers have contributed the work supporting eye tracking or gesture determination in several domains. They have used different systems and technology to trace the eyeball of the user.

### 2.1 Real-time detection of eyes and faces

In reference [1], the author tried to work on the system's slow response to eye detection. A processor namely, Pentium 11333 Mhz, machine is used for the detection of pupil and the face. This includes taking 30 frames per second. Moreover, it makes use of a PCI frame grabber that is incapable of processing the acquired image and therefore synchronization of the frames is done with the help of a hardware that illuminates the pupil.

### 2.2 Fast and robust classification using asymmetric boost and a detector cascade

In [2] the paper addresses a real-time detection of the face during which each scale and location within each image is analysed for real-time speed. Colour filtering or motion filtering in video clips are also used by other devices. Colour and movement in broad databases are not readily accessible. Vision based eye tracking is the clear picture of the attention tracking movement described on how the movements of the eyes were done and the way the tracking of the eyes together with the gaze movements accustomed occur. The instance of eye gaze provides context to the pc system that the user is watching and so supports effective interaction with the user systems and is accustomed to measure visual attention and to facilitate different sorts of user interaction tasks.

### 2.3 Perceptual user interfaces using vision-based eye tracking

In [3], The system utilizes robust eye-tracking data from multiple cameras to estimate 3D head orientation via triangulation. Multiple cameras also afford a bigger tracking volume than is feasible with a private sensor. The obtained results demonstrate the effectiveness of the top pose calculation subsystem, both applications use head pose data within the type of regions gazed by the user, verification is done based on whether gaze estimates by a people are the identical as those actually estimated by the system. The results are given within the type of a percentage of correct recognition by our tracking system.

### 2.4 OpenCV based real-time video processing using android smartphone

In [4], The author has used OpenCV for Real-time video processing within the android smartphone. Here the author is trying to create two Android applications supporting video processing using two different methods; one by using OpenCV library, the second one is using an Android library with a self-implemented algorithm called 'CamTest'. Here the author has used eight image recognition techniques to test the efficiency of the Android library and OpenCV in every frame of video captured on an Android smartphone. With above techniques, the paper concludes that most image processing techniques using the OpenCV library perform higher than the self-made Android library algorithm, and that OpenCV gives greater focus to improvement than energy consumption. Different approaches are used for eye detection.

### 2.5 Controlling mouse cursor using eye movement

In [5], the author has explained the three different approaches. The Regression approach is used to minimize the distance between the predicted and actual eye positions, Bayesian approach learns model of eye appearance and non-eye appearance. and Discriminative approach Treats the problem as one of classification.

## III. OBJECTIVES

1. To accurately detect gestures and process it to perform various tasks defined in the system.
2. To provide ease of access while using the system.
3. To create a utility where persons with disabilities can easily communicate with PC and use it with only facial gestures.
4. The user should be able to control all mouse activities just by using facial gestures.



5. User should be able to control some most used actions easily with gestures.

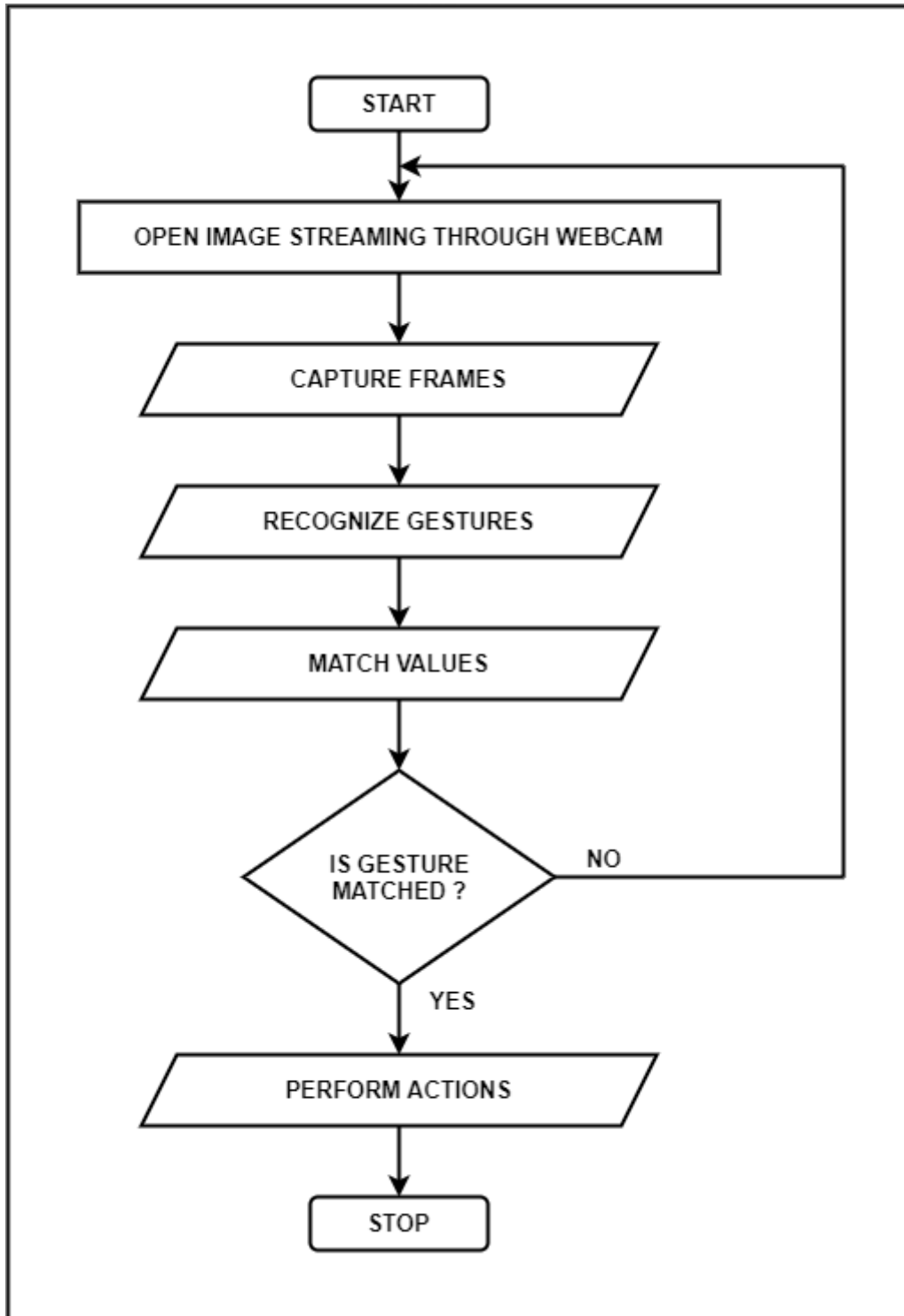
#### IV. PROPOSED METHODOLOGY

The implementation of the proposed system is as explained below:

1. The system continuously captures video through webcam.
2. This input stream is flipped and converted into frame and this frame is converted to grayscale.
3. The frame is processed for finding face. When a face is detected features of the face are extracted.
4. These features are compared with the trained model features and then gesture made by the user is recognised.
5. According to the gesture made the action on mouse cursor or any other action is initiated by the system.
6. Following Gestures are implemented along with their associated actions.

SR. NO.	GESTURE	ACTION
1.	Opening of Mouth (>0.6)	Activate/Deactivate Mouse Controls
2.	Right Eye Wink	Right Click
3.	Left Eye Wink	Left Click
4.	Squinting Eyes	Activate/Deactivate Scrolling
5.	Head Movements (Pitch and Yaw)	Scrolling/Cursor Movement
6.	Closed Eyes	Print Screen
7.	Mouth Open (0.2 to 0.4)	Volume Up
8.	Mouth Open (0.4 to 0.6)	Volume Down

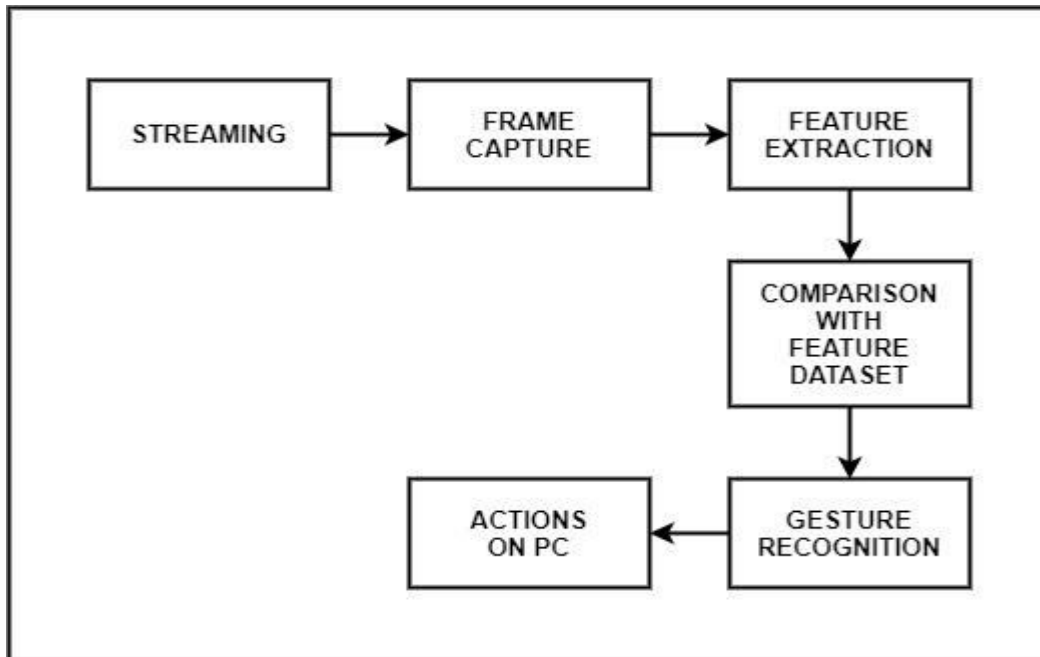
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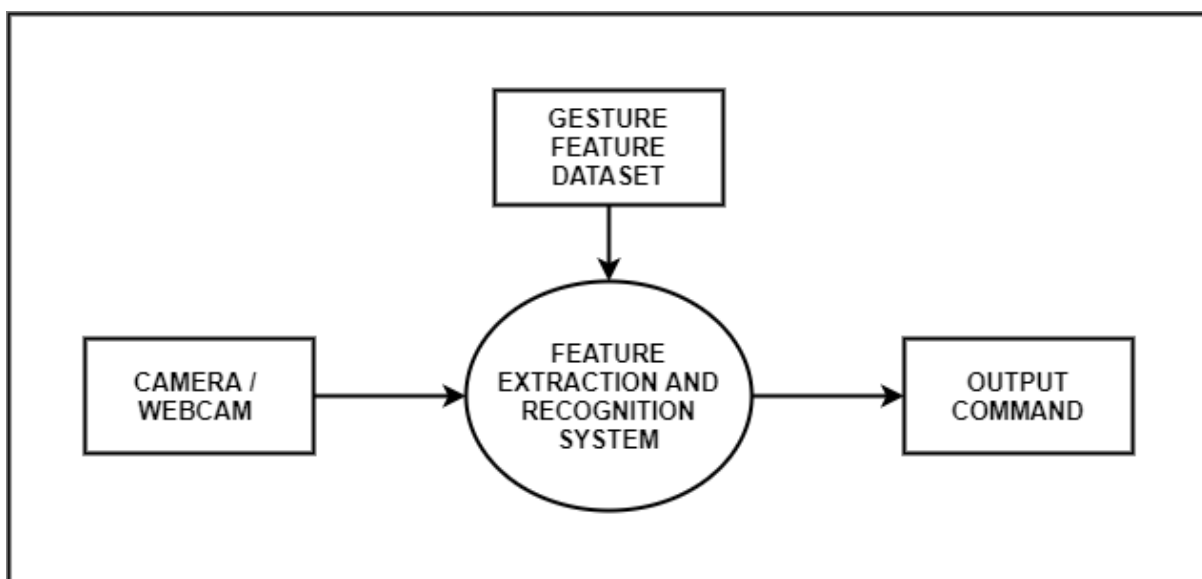


### SYSTEM ARCHITECTURE / BLOCK DIAGRAM

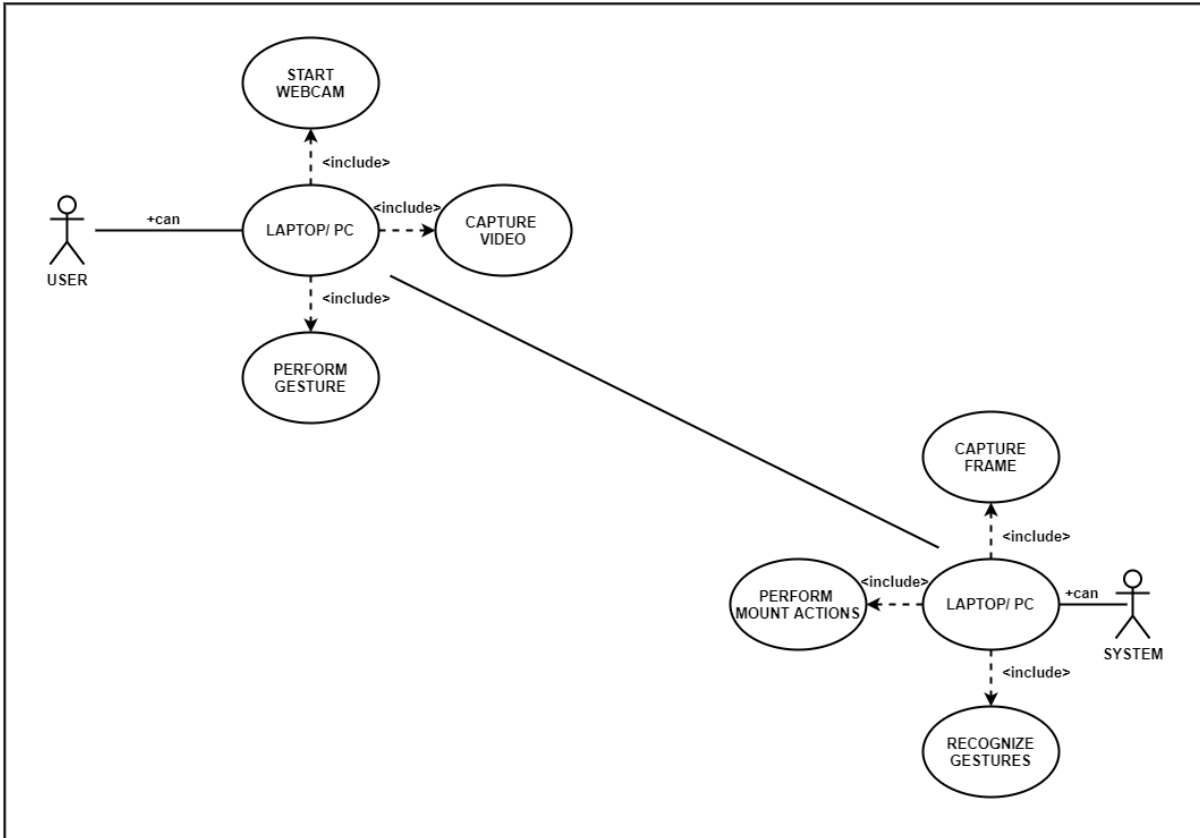
The proposed system comprises of building a utility system for controlling all the mouse actions along with some other actions. These actions are carried out by making facial gestures that are captured by the webcam and processed and recognized by the utility. The main aim lies in creating a system that is environment friendly to use and at the same time, it is effortless for handicapped or person with disabilities.



### DATA FLOW DIAGRAM



**USE CASE DIAGRAM**



**V. RESULTS & DISCUSSIONS**

The proposed system is able to track faces and locate the cursor on the computer’s screen successfully. The user is able to track the mouse and control the movement of the mouse as well as various mouse functions like clicking, dragging, scrolling using different eye movements. The user is also able to perform other action as stated in the implementation using gestures defined. This system is tested on multiple users.

**VI. CONCLUSION & FUTURE SCOPE**

The proposed system would take real-time input from users with the help of OpenCV and run the application in the background. This application can be implemented on laptops and desktops with inbuilt or external webcams. With the help of this application, the user can perform actions like moving the cursor in all directions, clicking functions, scroll function and drag function. Thus, the system would be functional and useful for physically challenged users. One prominent advantage of the application is available in a ready-to-install executable file without the need of external packages. The application can be set to auto-start on system boot to avoid the inconvenience of manually launching the application. Some system limitations are low lighting conditions because the user's face will not be clearly detected under low light. The system can only operate on devices with an integrated webcam or the webcam must be connected to the device explicitly. Future work will include efficient user input in low light conditions. Also, along with desktops and laptops, this application has the scope of being implemented on android devices. Customization options for gestures and computer activity can be added along with voice recognition-based typing methods. The system can be converted into an executable while where the user can re assign actions and gestures according to his/her requirement with restore to default options.



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