

Gesture Recognition based Virtual Mouse and Keyboard

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Abstract—Today computer vision is extensively used in our daily lives, right from a simple program for identifying a device's owner using image processing to face detection, colour recognition, car automation etc. it has reached an epitome. Computers are been evolving since their inception and now can be operated remotely, wireless. People having physical disorder are in need of an alternative approach to make the computers user friendly for them. To overcome this issue, in this project we have developed a system where we will be using computer vision to create a virtual mouse and keyboard using eyeballs and hand gestures. The camera mounted will capture different gestures of a human's hand and accordingly execute different functionalities like using unary finger gesture for selecting an alphabet and similarly detecting eyeball movement to move the cursor of the computer accordingly. It will act similar to physical keyboard and mouse just the difference that no external wires or devices will be used. The only hardware requirement will be a web-cam and coding is done using python. Thus, this system is not only cost-efficient but also comes offers free pre-installation requirements and is helpful for differently abled people.

Index Terms— Deep-Learning, Machine-Learning (ML), Haar Cascades, Image Processing, Frame Extraction, Hand Gestures, etc.

I. INTRODUCTION

In today's world the interaction between humans and machines is becoming more frequent. We are witnessing a drastic progress in computer world. One way of such interaction is in form of hand gestures. People who are physically impaired are given an opportunity to access the computers with ease. Its applications are widely seen in various fields such as UAVs, games, sign language recognition and so on making it of great significance. This interaction system is further divided into three parts as hand gesture segmentation, hand gesture tracking, and hand gesture recognition. Using eyeball tracking method, we will be able to move the cursor across the screen and different gestures will be used for right click and left click and similarly using simple gestures, different functionalities can be provided. We are developing a system that will replace the conventional way of keyboard typing and cursor movement using Deep learning.

$$\sum_{\substack{x_0 < x \leq x_1 \\ y_0 < y \leq y_1}} i(x, y) = I(D) + I(A) - I(B) - I(C)$$

Fig.1.Formula for calculating haar cascade feature

II. REVIEW OF LITERATURE

Computer vision has become prominent field of study and is being researched extensively and as a result there is an increasing need for communication/interaction with computers using these technologies. Hand gesture recognition is frequently utilised in robot control, intelligent furniture, and other areas because hand motions can represent enhanced information. The paper focuses on segmentation of hand gestures using skin colour model and an AdaBoost classifier grounded on Haar to account for the specificities of skin colour for hand motions. Additionally, hand gestures are denaturalized with one frame of video being cut for analysis. In this sense, the Cam Shift algorithm realises real-time hand gesture tracking by segmenting the human hand from the complex background. Convolutional neural network then recognises the area of hand motions that have been detected in real-time in order to achieve the recognition of 10 common digits. The Research has an accuracy of 98.3% [1].

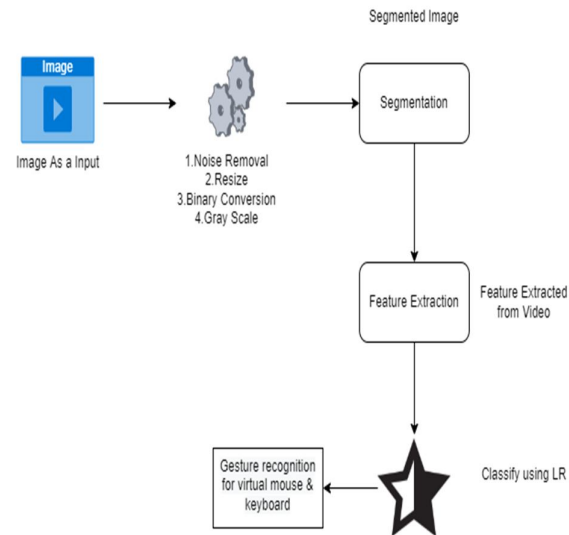


Fig.2.System Architecture

In this project, an optical mouse and keyboard are created utilising hand motions and computer vision. The project's webcam is its sole piece of hardware, and Python is used to code on the Anaconda platform. Here, the Convex hull defects are first constructed, and then an algorithm is generated and maps the mouse and keyboard functions to the defects using the defect calculations. [2].

This study includes two methods for tracking fingers: one using coloured caps and the other using hand gesture detection. This consists of three major steps: finger detection using colour identification, hand gesture tracking, and cursor implementation on the screen. Hand gesture tracking is generated in this study by detecting the contour and forming a convex hull around it. [3].

In this paper, a fully imaginary keyboard (I-Keyboard) with a deep neural decoder (DND) is developed to get over these restrictions. To the best of our knowledge, this article is the first to study the eyes-free, ten-finger typing situation of the I-Keyboard that does not require both a calibration phase and a specified region for typing. I-Keyboard improved typing accuracy (95.84%) and speed (45.57 words per minute) by 18.95% and 4.06%, respectively, above the baseline [4].

The author has proposed to create immersive gesture interfaces for 3D map navigation that work well in HMD-based virtual environments. According to the study's findings, moving objects around in three dimensions with your body is more fascinating and enjoyable for the user [5].

The study gives an introduction of a personal human computer interference system. The centre of the pupil is directly related to the movement of the cursor. The Raspberry Pi and OpenCV are used to build this pupil detection procedure. The SD card has been upgraded with the operating system needed to start the Raspberry Pi. Once the application programme has been loaded into the Raspberry PI, it will begin to run [6].

This paper describes an interactive surface application for human-computer interaction that uses computer vision. The proposed method presents a system (V-Touch) based on Haar-like features with a single camera. The suggested solution simulated all conventional keyboard and mouse activities [7].

This article suggests an HCI-based virtual mouse system that makes use of hand movements and computer vision. To perform mouse indicator motions and icon selection, this system relies on picture comparison and motion detection technology [8].

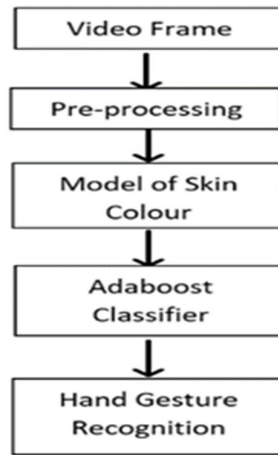


Fig.3.Segmentation of Hand Gestures

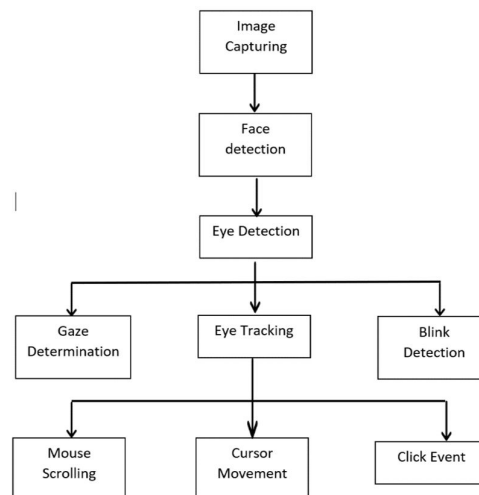


Fig.4.Work Flow of Virtual Mouse

Using a computer to perform a menial chore that limits people impacted by severe neuromotor conditions like amyotrophic lateral sclerosis ALS that may result in Locked-in syndrome (LIS). This research examines eye-based interaction techniques, demonstrates a virtual keyboard that makes use of movement tracking as a text input, gaze detection [9].

The suggested driven technique uses body motions and is a fantastic option for providing visitors with a simpler, more intuitive way to navigate and engage with the displays. They have also created a virtual environment in accordance with the images displayed in the virtual gallery. Visitors can have an educational experience by viewing multimedia films in a simulated Barbizon environment that is related to the show. The multimedia content will be manipulated using a hand gesture interactive technique [10].

Based on the input signal from a three-axis accelerometer, a gesture recognition model is created in this research to identify hand movements that are down, up, left, tick, right, and cross. Gesture-based mouse control makes use of the continuity and dynamics of the user's hand movement to control the mouse movement. The primary focus in this discipline comprises not only the recognition of faces and hand gestures but also the recognition of

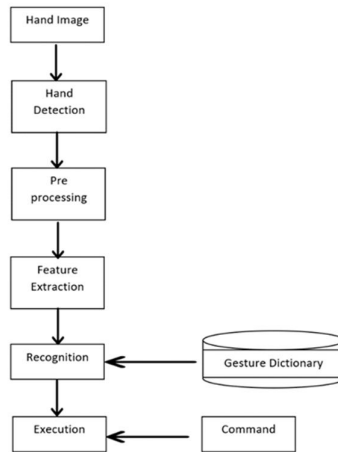


Fig.4.Proposed Methodology for Keyboard

facial emotions. With this implementation, a speech-impaired and paralysed patient could get an electronic hand glove [11].

Using Open CV and PyAutoGUI background conditions, illuminance effect and skin colour defects are studied in this paper. Determining the hand gestures and mapping them corresponding Mouse Control are executed [12]. This Paper has state that a mouse is created using 2D hand gestures. Camera based colour recognition technique is used to detect the hand gestures. A virtual HCI (Human Computer Interaction) is developed to detect hand gestures to control activities like left, right clicks and hovering [13].

Here in this paper author has developed a system where hand gestures are implemented to create a computer mouse. This approach uses novel skin colour segmentation technique and various operations as blob counting. Webcam and MATLAB is implemented. System is known for its simplicity as it is successfully tested without any complexity issues [14].

III. CONCLUSIONS

In this paper, we have proposed a Mobile application which will be using the camera to capture images of the eyes of the user and will use the captured image to detect the presence of cataract in the eye. Users can be either People suffering from cataract who need to check the severity and want to know the required precautionary measures to cure cataract or the people who just want to check their eyes to identify any presence of cataract. If the model detects any presence of cataract in the images captured, it will alert the user with their different levels of severity and the required precautionary measures which will help the patient in faster recovery. By using this application all users will be able to detect cataracts just by using a Smartphone with a good-quality camera remotely anytime anywhere. One of the advantages this application has is to permit the user to self-screen which can be performed anytime and at any remote location, it can also be used as a portable screening answer in regions with restricted or fewer medical facilities or skilled staff.

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