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Gesture Recognition Based Virtual Mouse and Keyboard

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Abstract **- Now a day's computer vision has reached its zenith, where a computer can identify its proprietor using a simple program of image processing. In this stage of development, people are using this vision in numerous aspects of day-to-day life, like Face Recognition, Colour discovery, Automatic auto, etc. In this design, computer vision is used in creating an optic mouse and keyboard using hand gestures. The camera of the computer will read the image of different gestures performed by a person's hand and according to the movement of the gestures the Mouse or the cursor of the computer will move, indeed perform right and left clicks using different gestures. Also, the keyboard functions may be used with some different gestures, like using one cutlet gesture for ABC elect and four- figure gesture to swipe left and right. It'll act as a virtual mouse and keyboard with no line or external bias. The only tackle aspect of the design is a webcam, and the coding is done on python using Anaconda platform. Then the Convex housing blights are first generated and using the disfigurement computations an algorithm is generated and mapping the mouse and keyboard functions with the blights. Mapping a couple of them with the mouse and keyboard, the computer will understand the gesture shown by the stoner and act consequently.**

Keywords: Convex Hall, Image Processing.

1. Introduction

Driver exhaustion might be a vital considers an outsize kind of car collisions. Late insights gauge that yearly one, 200 passing and seventy-six, 000 wounds will be ascribed to weakness associated crashes. The occasion of advances for exploring or forestalling state in the driver's seat might be a noteworthy test inside the segment of mishap dismissing frameworks. As aftereffects of the peril that state presents out and about, ways that purchased to be constrained to be produced for neutralizing its effects. The point of this venture is to build up an encapsulation state discovery framework. the most concentrate square measure expecting to be put on emerging with a framework which will precisely screen the open or shut condition of the driver's eyes in timeframe. By recognition the eyes, it's accepted that the side effects of driver weariness will be identified early enough to dodge a car crash. Identification of weariness includes a succession of pictures of a face, and moreover the perception of eye developments and squint examples. The investigation of face photographs might be an inescapable examination territory with applications like face acknowledgment, virtual devices, and human recognizable proof security frameworks. This venture is focused on the restriction of the eyes, which includes seeing the total picture of the face, and choosing the situation of the eyes by a self created picture handling rule. When the situation of the eyes is discovered, the framework is intended to check whether or not the eyes square measure opened or shut and acknowledge weakness.

2. Literature Survey

Research on the Hand Gesture Recognition Based on Deep Learning. With the rapid development of computer vision, the demand for interaction between human and machine is becoming more and more extensive. Since hand gestures can express enriched information, the hand gesture recognition is widely used in robot control, intelligent furniture and other aspects. The paper realizes the segmentation of hand gestures by establishing the skin colour model and AdaBoost classifier based on haar according to the particularity of skin colour for hand gestures, as well as the denaturation of hand gestures with one frame of video being cut for analysis. In this regard, the human hand is segmented from the complicated background; the real time hand gesture tracking is also realized by Camshafts algorithm. Then, the area of hand gestures which has been detected in real time is recognized by convolutional neural network to realize the recognition of 10 common digits. Experiments show 98.3% accuracy.

Dynamic and Personalized Keyboard for Eye Tracker Typing. Patients who suffer from Amyotrophic lateral sclerosis (ALS) or stroke cannot talk and express their everyday basic needs and requests. They can communicate using eye trackers since they can still use their eyes and sometimes move their heads. This study suggests new methods for improvements in both speed and ease of use for eye tracker software. The first one is letter prediction to improve the speed, and second one is a new design that

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obviates the need of blinking with eye trackers, thus providing more comfortable and longer sessions and writing.

Fully Imaginary Keyboard on Touch Devices Empowered by Deep Neural De. Text entry aims to provide an effective and efficient pathway for humans to deliver their messages to computers. With the advent of mobile computing, the recent focus of text-entry research has moved from physical keyboards to soft keyboards. Current soft keyboards, however, increase the typo rate due to a lack of tactile feedback and degrade the usability of mobile devices due to their large portion on screens. To tackle these limitations, we propose a fully imaginary keyboard (I-Keyboard) with a deep neural decoder (DND). The invisibility of I-Keyboard maximizes the usability of mobile devices and DND empowered by a deep neural architecture allows users to start typing from any position on the touch screens at any angle. To the best of our knowledge, the eyes-free ten-finger typing scenario of I- Keyboard which does not necessitate both a calibration step and a predefined region for typing is first explored in this article. For the purpose of training DND, we collected the largest user data in the process of developing I-Keyboard. We verified the performance of the proposed I-Keyboard and DND by conducting a series of comprehensive simulations and experiments under various conditions. I-Keyboard showed 18.95 and 4.06 increases in typing speed (45.57 words per minute) and accuracy (95.84), respectively, over the baseline.

Algorithm for decoding visual gestures for an assistive virtual keyboard. Text production is one of the most frequent activities on a computer, a trivial task that can be limiting for individuals affected by severe neuro motor disorders such as Amyotrophic Lateral Sclerosis (ALS) that can lead to Locked-in syndrome (LIS). These individuals need augmentative and alternative communication tools, since they may have only the eye movements as a form of communication and interaction with the outside world. This work investigates methods of interaction based on eye movement tracking and presents a virtual keyboard that utilizes gaze detection as a text input. It describes the development of the shape detection algorithm for the assistive keyboard, typed word voting from a Brazilian Portuguese lexicon and preliminary results on the decoding algorithm.

Virtual Mouse Control Using Collared Fingertips and Hand Gesture Recognition. In human-computer interaction, virtual mouse implemented with fingertip recognition and hand gesture tracking based on image in a live video is one of the studies. In this paper, virtual mouse control using fingertip identification and hand gesture recognition is proposed. This study consists of two methods for tracking the fingers, one is by using coloured caps and other is by hand gesture detection. This includes three main tips that are finger detection using colour identification, hand gesture tracking and implementation on onscreen cursor. In this study, hand gesture tracking is generated through the detection of the contour and formation of a convex hull around it. Features of hands are extracted with the area ratio of contour and hull formed. Detailed tests are performed to check this algorithm in real world scenarios.

3. Objective

The introductory ideal is to develop a virtual mouse and keyboard using the generalities of hand gesture recognition and image processing which will eventually move the mouse pointer according to the hand gestures, also with the help of the gesture can use keyboard functions which will be defined as per the convenience of the stoner. Reducing the cost of tackle.

This approach will make tasks trickier and further lightly like creating 3D models, browsing the imaginary part in medical world during surgery and one stylish thing is that without touching anything it can work indeed in architectural designs and in automated structure.

4. Proposed System

Mouse

The Mouse uses a convex hull process for its working, defects are captured or read, using these defects the functions of the mouse are mapped. The process of this image recognition process solely focuses on defects and conditional statements, the convex hull takes the gap of the fingers as defects, so it can be used for multiple gestures and mapping commands. The following steps are followed for the use for gesture recognition and its mouse functions:

- In the first step, the web cam will start and the video and what is present in front of the camera can be seen.
- In the next step the user has to keep their hand in the required border made on the screen.
- In this step the different hand gestures will be shown by the user, these gestures will be not any kind of a gesture but those which have been trained to the computer from the beginning.
- If the gesture matches, then a green-colored border will be generated and by moving the hand the mouse cursor will also move.
- There is total four different kind of gesture, one is used to move the cursor, another one is used to do the right click, another one is used for left click, and another gesture for scrolling up and down.

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- When no hand is placed in the bordered region a comment will show that there is no object placed.
- The similar gestures may not match sometime this is due to the reason that the user is not showing the gesture accurately or there are a few noises which are affecting the inputs.
- The gestures count the defect using Convex Hull method and relates with the object used for mapping.
- The gesture hence shows the defects which in turn help in left and right click options defect=5 then right click, defect=3 then left click.

Keyboard

The process used for this keyboard function is a bit different than the convex hull process, here the hand position system is used that is, the video that is capturing used the position of the hand is captured by the computer. In the open video window, a miniature virtual keyboard is mapped. Using the hand position technique, the keyboard functions can be selected which have been mapped and using this process the keyboard function executed, a math function is used to judge the position of the hand and turn it into a matrix location which makes the position recognisable for the computer. The following steps are followed for the use for gesture and its Keyboard functions:

- In the first step the web cam will open, and the user can see the camera window.
- The alphabets and other keyboard essentials are seen in the red borders.
- With proper hand gesture the alphabets of the keyboard can be moved and do computer functions also.
- With an open palm the keyboard can be moved left to right to get all the alphabets and keyboard functions.
- By putting the finger over the designated key they can type the required alphabet or keyboard functions.
- The printed alphabets will be seen on the camera window as shown in figure 2.

5. System Architecture

The camera starts and starts detecting any object with its colour close to skin colour of human being. The video captured is then compared with the module and the code written, if the code says the shown object captured by the computer camera resembles human hand, then it moves on to the next step that is Convex Hull detection. The process of convex hull then decides whether the shown object is a hand or not, if so then it will count the number of defects. Similarly, after the process ends the code is written in such a way that the number of errors detected is counted and a conditional statement is created. This conditional statement is mounted with the or it is better to say mapped with the mouse to derive a perfect mapping of the mouse functions with the defects counted. Similarly for the keyboard, but there is a slight difference in the approach of the keyboard in terms of the mouse. The keyboard uses precision and hand position interface, it detects the keyboard function in terms of the hand position and does the function that the hand position fixes upon. The scrolling function is done as the movement of the hand position from right to left. The hands position is detected only by the texture and colour of the individuals' hand and its quite accurate in terms of colour and texture detection. The simplicity of this project is that it requires none hardware or external device to be connected the only device needed in this process is a webcam. The software properties that are used for this project includes Python on Anaconda platform.

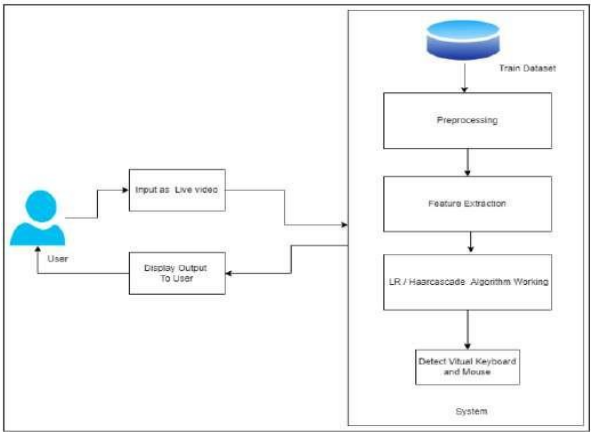

Figure 1: System Architecture

6. Software and Hardware Requirements

Software Requirements:

- Language: Python
- Professional Environment: Anaconda
- Database: MySQL, Xamp Server Hardware Requirements:
- System Type: 64-bit or 32-bit
- Processor: Intel core i5, 2GHz
- Random Access Memory (RAM): 8GB
- Storage Capacity: 80 GB
- IO device: Mouse and Keyboard
- Device Name: Laptop or Computer with camera

7. Advantages

- Instant notification of drug interactions and allergies.
- Error-free prescription drug use.
- Controlled substances are easily prescribed.
- Track prescriptions for controlled substances.
- Quickly reconcile your medication history.
- Meet the requirements for meaningful use.

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8. Mathematical Module

Let S Be the System and it consist of following: S= {I, P, O, Su, F}

Where,

- I=No of inputs.
  - I= {U}
  - U= No of Users
  - U= {u1, u2, …., un}
- O=Output of the project
  - That means detect eyes and hand of the user and make click action accordingly.
- P=Processes that are follow:
  - P= {ET, ED, HT, HD, Click}
    - ET= Eye Tracking.
    - ED=Eye Detection
    - HT=Hand Tracking.
    - HD=Hand Detection.
    - Click= Perform Click Function.
- Su=Success if our system can detect correctly the users are drowsy or not.
- F= Failure of the system if it crashed.

9. Result and Discussion

The below figure Fig 2. depicts the use of convex hull process here the defect count is one, in the algorithm have conditioned that if the defect count comes to one then the position of the mouse has to change with respect with the location of the defect or location on the finger, as can see the red dot in the index finger it maps the location with the required cursor.

The below figure Fig 3. convex hull process being used, as the previous figure the defect count is 4, in the algorithm have conditioned that if the defect is four then right click will occur as per the mouse functions. Similarly, if the defect count is 5 the left click function will take place.

Following is the output if the Hand and Face is detected:

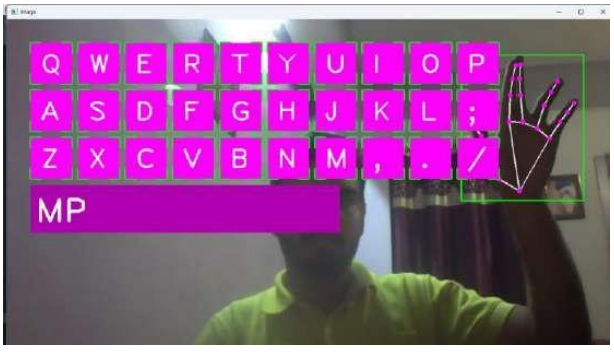

Figure 2: Hand Recognition

Figure 3: Face Recognition

Limitations

- Text cannot be entered into the computer using the mouse.
- Even without a mouse, a computer can still perform all of its intended functions.
- The usage of the mouse is constrained because it cannot be used to edit specific sections of a document.
- There are various alternatives to the mouse, including the trackball, light pen, joystick, and touch screen.
- When entering data, mistakes are simple to make.
- Data entry may take a while if you can't touch type.

10. Future Scope

The suggested AI virtual mouse has numerous drawbacks, including a little loss of right click precision. Since its creation, the computer mouse has advanced significantly. Because of this, it is also idealistic to think that soon we will fully give up using a physical keyboard or a computer mouse. Since the conventional mouse and keyboard haven't evolved much in a while, there is a lot of room for hybrid devices to take over.

11. Conclusion

This project is proposing a system to recognize the hand gesture and replace the mouse and keyboard function. That includes the movement of the mouse cursor, the drag and click with the keyboard features like printing alphabets and other keyboard functions. The process of skin segmentation is utilized to separate the colour/image of hand with its background. Remove arm method, which effectively solves the situation of taking into the whole body into the camera. In general, the proposed algorithm can detect and recognize hand gesture so that it can operate mouse and keyboard features and also create a real-world user interface. 3d printing, Architectural drawings and even doing medical operations from anywhere to everywhere. This project can be easily applied, and its application can be very vast in medical science

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where computation is required but couldn't fully be implemented due to lack of human computer interaction.

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