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Implementation Of Gesture Recognition Based Virtual Mouse and Keyboard

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Abstract **- Today, computer vision has advanced to the point where a machine can recognise its owner by running a straight forward picture processing application. People are employing this in this period of growth because vision in a variety of everyday activities, including Face Recognition, Color Detection, Autopilot Cars, etc. In this project, computer vision, or a camera, is utilised to recognise hand gestures to create a virtual mouse and keyboard. The computer's camera will scan the image of various hand gestures made by a user, and the computer's mouse cursor will move and even carry out various functions using various movements in accordance with the gestures. Similar to how some other motions can be used to access keyboard features.Without a wire or other external devices, it will function as a virtual mouse and keyboard. The project's webcam is its sole piece of hardware, and Python is used to code on the Anaconda platform. This project uses cutting-edge Machine Learning and Computer Vision algorithms to recognise hand movements, and it operates without the need for any additional hardware.**

Index Terms - Face Recognition, Machine Learning, Virtual Mouse And Keyboard, Anaconda Platform

I. INTRODUCTION

Human computer interaction is made simple by using only hand gestures with the help of a virtual mouse and keyboard developed from hand gestures. The amount of direct contact with the computer is minimal. Static and dynamic hand gestures can be used to virtually control all of the input and output activities. When using wireless devices, such as a wireless mouse or keyboard, a dongle is needed to connect to the PC and a battery is needed to power the device while it is in use. However, in this study, the user manipulates the computer's mouse and keyboard using hand gestures and either a built-in camera or a webcam.It has been suggested that the recognition of hand gestures is a key industry 4.0 development technology for HCI (HCI). Without even physically touching objects like a mouse or a keyboard, they enable computers to record hand motions and carry out given directions..

A. Motivation

• Common in interpersonal communication are gestures

• Offers plenty of room for creating an own method of human-machine interaction

B. Problem Definition

The proposed Hand Gestures based virtual mouse and keyboard system can be used to solve real-world issues like when there is no power backup for wireless mouse and keyboard to operate and situations where there is no room for a physical mouse or keyboard to use. It can also be used by people who are unfamiliar with using a mouse or keyboard.A person can easily control his or her computer within a greater range wirelessly without any powered backup device, i.e., only using hands, but in the COVID-19 situation it is not safe to use the devices which are used by the public in offices or internet cafes by touching them because it may result in a possible situation of virus spread by touching them. The proposed Hand Gestures based virtual mouse and keyboard system can be used to overcome this problem.

C. Objective:

The main goal of the proposed hand gestures-based virtual mouse and keyboard system is to create a replacement for the conventional mouse and keyboard system to perform and control the mouse and keyboard functions. This can be done with the aid of a web camera that records hand gestures and then processes these frames to perform the specific mouse and keyboard functions.

II. RELATED WORK

Paper 1: Research on Deep Learning-Based Hand Gesture Recognition"
Authors: Shu-Bin Zhang, Ting-Ting Ji, and Jing-Hao Sun
The need for interaction between humans and machines is growing as computer vision technology advances quickly. Hand gesture recognition is frequently utilised in robot control, intelligent furniture, and other areas because hand motions can represent enhanced information. The segmentation of hand gestures is accomplished in this study by developing a skin colour model and an AdaBoost classifier based on haar to account for the specificities of skin colour for hand motions. Additionally, hand movements are denaturized with one frame of video being cut for analysis.In this sense, the human hand is separated from the complex background, and the CamShift algorithm also makes it possible to track hand gestures in real-time. 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. Research indicates 98.3% accuracy.
Paper 2: Personalized and Dynamic Keyboard for Eye Tracker Typing
Authors:Kadir Akdeniz and Zehra C. ataltepe
Stroke and Amyotrophic lateral sclerosis (ALS) patients are unable to speak or convey their daily necessities. Since they can still move their heads and use their eyes, they can converse via eye trackers. This study offers fresh ideas for enhancing the speed and usability of eye tracking software. First, letter prediction is used to increase speed, and second, a novel design eliminates the need for blinking while using eye trackers, allowing for more comfortable and extended writing sessions.
"Paper 3: Visual gesture decoding algorithm for an assisted virtual keyboard"
Authors:Rafael Augusto Da Silva, an IEEE member, and Antonio Claudio Paschoarelli Veiga, an IEEE member,
One of the most common computer tasks is creating text, a simple task that can be difficult for those with severe neuromotor illnesses like Amyotrophic Lateral Sclerosis, which can cause Locked-in syndrome. Since these people may only be able to communicate and engage with the outside world through eye movements, they require augmentative and alternative communication tools. This study explores eye movement-based interaction techniques and introduces a virtual keyboard that accepts text input via gaze detection.
Paper 4: "Using Colored Finger Tips and Hand Gesture Recognition, Virtual Mouse Control,"
Authors: Galla Vamsi Krishna, Thumma Dhyanchand, and Vantukala VishnuTeja Reddy
One study in the field of human-computer interaction uses a virtual mouse with finger tip recognition and hand motion tracking based on image in a live video.
This work proposes finger tip identification and hand motion detection for virtual mouse control. The two finger tracking techniques used in this study are hand gesture detection and employing coloured caps.
Paper 5.” Hand Gestures Recognition Based Virtual Mouse and Keyboard ”
Authors:Mosam Shambharkar , Sanket Chore , Prince Barsagade , Piyush Chavhan , Prof. D. R. Uike
Today, computer vision has advanced to the point where a machine can recognise its owner by running a straightforward picture processing application. People use this vision in many parts of daily life in the current technological age, including face recognition, colour detection, autonomous vehicles, etc. In this project, computer vision, or a camera, is utilised to recognise hand gestures to create a virtual mouse and keyboard.
Paper 6:Personal gesture-driven virtual walk-through systems
Author:Ling-Erl Cheng; Hung-Ming Wang; Jun-Ren Ding; Ji-Kun Lin; Zhi-Wei Zhang; Jar-Ferr Yang
In this research, we suggest using a body gesture as an interface to traverse the displayed multimedia video contents rather than a mouse and keyboard. To build the instructions of interactivities for real applications, we have established several control modes that are based on human natural movements.

III. SYSTEM DESIGN

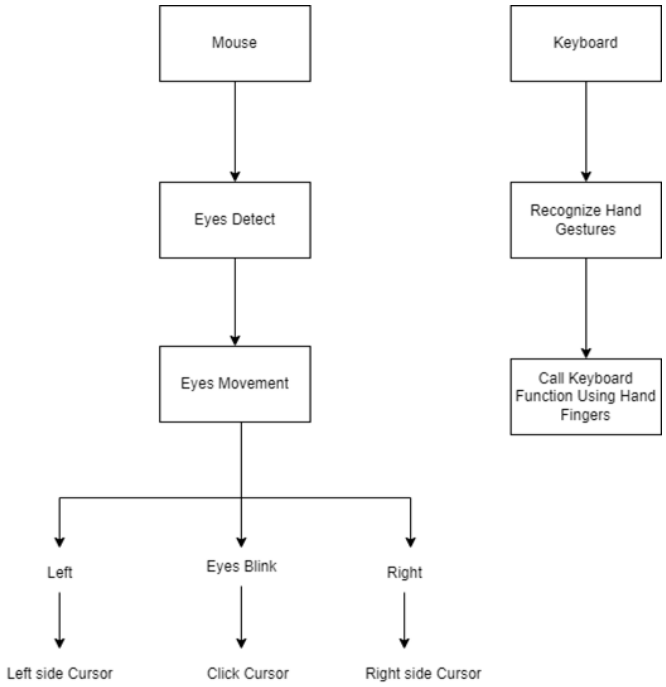


Fig.1 System Architecture

IV. SYSTEM METHODOLOGY

The mouse system was created in Python, and in order for it to work, the following Python modules had to be loaded. Numpy is a Python extension module.
It provides rapid and efficient actions on groups of relevant data. Open-source Python library Scipy is utilised in technical and scientific computing. OpenCV is a collection of programming tools with a main interest on real-time computer vision. PyautoGUI is a Python-based, cross-platform GUI automation module. This enables you to automate computer tasks by managing the mouse and keyboard in addition to carrying out basic image recognition. The device recognises a person's pupil using the webcam. Students learned that one can now control the mouse cursor by eye movement.

The pointer movement can be seen on the computer's home screen. To type using our fingertip on the virtual keyboard, we took the following actions:
Step 1: using the webcam on the PC to capture live video
Step 2: Processing each every image frame from the recorded video
Step 3:frame-to-image conversion
Step 4: Virtual Keyboard
Step 5: Hand gesture recognition relies on hand landmarks.
Step 6: Position the item over the simulated keyboard, then turn the input device..
Step7.Convolutional Neural Network character identification methods should be printed.

The computer then locates the face. The benefits of gesture recognition begin after the system recognises and captures the eyes. Then the system locates the students. The last module describes the method used to advance a number of fields, such as beginning to move the mouse cursor by observing pupil movements.

Module 1 GUI:Our GUI was created in TKinter. The Python binding for the Tk GUI toolkit is called Tkinter. It serves as the de facto default GUI for Python and is the official Python interface to the Tk GUI toolkit.

Module 2: System for Registration and Login: Before using the application, users must register. Users' data is stored in the database, which is then fetched when they log in to the system. Only those who have registered may log in to the system.

Module 3: Database Module: User data is stored in databases. The DBsqlite database was employed.

Module 4: Mouse-like eye-based interface that translates eye motions like blinking, gazing, and squinting into movements of the mouse cursor. This method requires a basic camera in addition to Python, OpenCV, NumPy, and a few more facial recognition algorithms using the Harr Cascade algorithm.

Module 5:Keyboard Usage: Gesture-based controls will be used to control keyboard usage. For gestures, we use the forefinger and middle finger. We are using top, mid, and base as our locating coordinates. We will use a keyboard to manage finger movement.

A. Algorithm:

1. Gesture Recognition Algorithm:

The algorithm's objectives are to detect movements quickly in real-time, eliminate interference, and make it harder to capture accidental gestures. In this study, static gesture controls such as on, off, rising, and decreasing are used.The area of artificial intelligence and image processing that is expanding most quickly is gesture recognition. To control computers and other electronic appliances, gesture recognition is a process that identifies the movements or postures of various human body parts.
Understanding of Hand Gestures. A straightforward rule classifier may be used to identify the hand motion once the fingers have been observed and identified. The rule classifier predicts the hand motion based on the number and distribution of fingers found. What fingers are detected depends on the content of the fingers.

2. Haar Cascades :

No matter where they are in the image or how big they are, objects can be found using the process known as the Haar cascade. This algorithm can operate in real-time and is not overly complex. A haar-cascade detector can be trained to recognise a variety of items, including automobiles, bikes, structures, fruits, etc. The cascading window is used by Haar cascade, which tries to compute features in each window and determine whether it might be an object.
All well-known haar cascades are maintained in a repository by the opencv library and can be used for:

- Detection of human faces
- Eye recognition
- Mouth/nose detection
- Automobile detection

B. LIMITATIONS

- The current application appears to be more practical and user-friendly.
- The convex hull algorithm may malfunction if another external noise or flaw is found in the webcam's operational range.

- An effort has been made to reduce the dependence of the input modality on the user's hand motions.
- A person's hand with five fingers only has a small number of flaws, therefore only a few gestures can be used.
- The keyboard's user features are rather limited.
- The click features could have been highlighted more.

D. RESULT

A hand tracking module is used as the foundation for both finger counting and virtual keyboard hand tracking, which records the forefinger and middle finger of the hand and shows frame rate. Later, gesture volume adjust was introduced, which extracts certain hand characteristics to control volume. These initiatives are meant to boost productivity. We employ tools like python, media-pipe, and open-cv. Google is the developer of media-pipe. It is rather effective and aids in offering speedy answers to ai initiatives.
The frames that the laptop's webcam collected serve as the foundation for the suggested mouse mechanism. The video capture object is created and the camera is turned on using the opencv library. Along with media pipe, a face-detection object is made, and based on the detection of the human eye, virtual mouse operations are carried out on the laptop screen.

Pyautogui is utilised in this case to enable the stimulation of mouse cursor movements and clicks.

HOME PAGE:

Fig.1 show the home page of system . The system provide 3 buttons for user . 1. Login for user to login in the system 2.registration button for new user registration 3.exit button use to exit from the system

FIG .1 Home page

REGISTRATION PAGE:

The registration page is use to register new user.user need to enter complete information required in form.after registration user is able to login into the system.

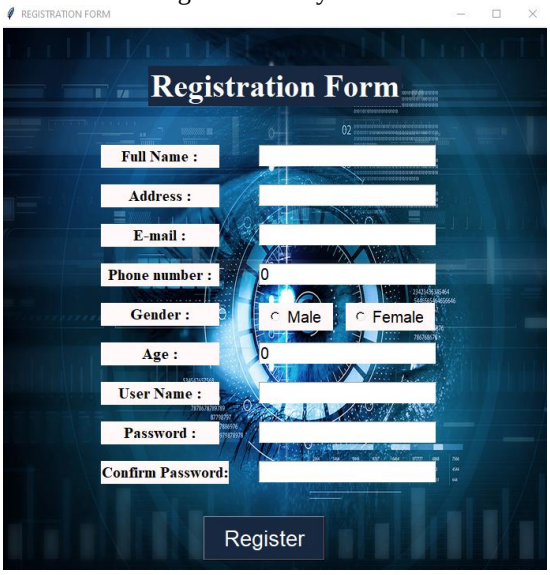


FIG.2 Registration form

LOGIN PAGE:

After successfully registration user can login using login form.

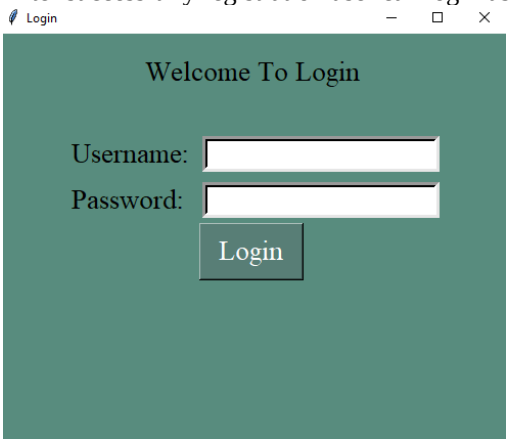


FIG. 3 Login page

MAIN GUI PAGE:

After login successfully gui master page open .user will get 3 button 1.recognized using mouse. 2. Recognized using keyboard and 3. Exit

FIG. 4 Main GUI Page

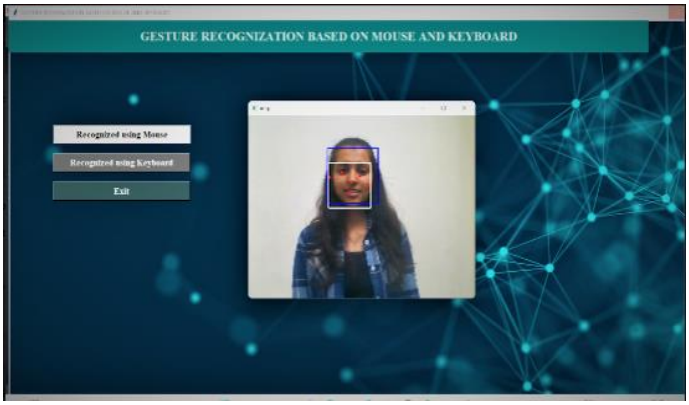
KEYBOARD GESTURE PAGE:

When user click on recognized using keyboard button , keyboard gesture open. User give input from 2fingers.Each letter click by 2 fingers will print on text box given below

FIG.5 Keyboard gesture page

MOUSE GESTURE PAGE:

The system is a mouse-like eye- based interface that converts eye movements like blinking, staring, and squinting into mouse cursor actions. The software requirements for this technique include Python, OpenCV, NumPy, and a few more facial recognition HarrCascade algorithm, as well as a basic camera.



VI. CONCLUSION

The basic goal of the hand gestures-based virtual mouse and keyboard system is to utilise hand gestures rather than a physical mouse or keyboard to operate the mouse pointer and keyboard functionalities. The suggested system can be implemented by utilising a webcam or an integrated camera that recognises hand motions and hand tips and processes these frames to carry out certain mouse and keyboard activities.

We may infer from the model's results that the suggested Hand gestures virtual mouse and keyboard system has performed admirably, has better precision than the existing models, and also effectively gets around the majority of the drawbacks of the latter.

Since the proposed mouse and keyboard system can be utilised virtually using hand gestures instead of the conventional physical mouse or keyboard, it may be used for real-world applications and can also be used to stop the spread of COVID-19 because it has more accuracy.

The model has certain drawbacks, including a slight loss of precision in the scrolling mouse function, some challenges with clicking and dragging to pick text, and the inability to select all of the keyboard's keys with a pinch gesture. As a result, we will seek to address these issues by enhancing the finger tip detection algorithm to deliver more accurate results and expanding the implementation of keyboard keys.

V.FUTURE WORK

For straightforward pointing and pinching actions, the technology works well, but there is still much space for improvement. The system now employs a static background, but it would be highly desirable and crucial to deploy this hand tracking system in an augmented reality environment where a user may interact with virtual 3d items in the real-world while wearing a head-mount display. In this case, a multidimensional camera angel is required to capture the hand gestures in order to capture information from more than one layer of the recording capability. There will be a need for 3-

axis cameras, which are cameras on the x, y, and z axes.The 3-d image will be acquired or recorded based on camera recordings, improving the accuracy of the defect count and making it simpler for the computer to understand the image and identify the problems.

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