



# An Interactive Computer System with Gesture Based Mouse and Keyboard

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**Abstract:** The abstract of an interactive computer system provided with a gesture-based virtual mouse and keyboard is for technology that allows users to control computers using hand gestures as opposed physical input devices like a traditional mouse and keyboard. This technique is based on using computer vision or any other sensor mechanism to capture the hand movements of the user and command them for moving a virtual mouse & keyboard, displayed at that screen in addition it may provide clicking functions too. The system uses gesture recognition algorithms which enable it to understand the users' gestures precisely from a distance making them operate different functions inside graphical user interface (GUI). The virtual mouse provides cursor movement, left-clicking and double-clicking functionality as well as clicking-and-dragging an object within the interface while the virtual keyboard lets users type in text or trigger special key-combinations.

The system was designed around the idea of providing an intuitive and natural way for interacting with computers, specifically in scenarios where conventional input devices are undesirable or impractical. It improves user mobility and can be useful when presentations, gaming or touchless environments are anticipated, if the end user is disabled due to physical impairments that make it difficult for him/her to use traditional means of input. With a combination of sophisticated gesture recognition algorithms, real time tracking and comprehensive user interface designs the system will attempt to offer an ideal all around experience for users.

**Keywords:** Machine Learning, GUI, Virtual mouse, Hand Gesture, Computer Vision.

## I. INTRODUCTION

Lately, there is an increased attention to design novel and more natural human-computer interaction approaches. While traditional input devices like mice and keyboards have been around for decades, they are inherently limiting when it comes to offering a truly immersive user experience. In pursuit of addressing some of the constraints, researchers and engineers around the world have been pushing forwards several alternative strategies which one is enabled by interactive computer system using gesture-based virtual mouse and keypad. This technology uses computer vision, machine learning and sensing tech to allow users to control or interact with a computer using hand gestures each field has its main feature which over dominates some others. Those systems do away with the need for physical input devices and in doing so offer users a more natural way to interact with computers.

And as gesture-controlled systems are also more accessible to users with physical disabilities or movement impairments. Gesture based interfaces have presented to be a very useful medium for people with impairments, who are unable to use traditional devices like mouse or key-boards directly e.g. patients under coma condition, paralyzed users etc. This gives them indirect ways of interacting inputs as well allows developers/ villagers work on gesture- tangible interactions (e.g sign language) further making the environment usable and user interactive.

This paper introduces an endeavour to create a gesture-controlled virtual mouse and keyboard which can be accessed on conventional computers. We will explore the technologies underpinning this new mode of interaction — including computer vision algorithms and gesture recognition techniques for tracking hand movements accurately, in real time. In addition, we will seek to examine some of the UI design guidelines and usability aspects that help in building a smooth yet efficient interaction.



## II. RELATED WORK

Gestures vs Clicks: A Study of Gesture/Pointing Device Performance" by Tabitha Peck and Doug Bowman (2016): This research paper is published to measure the effect of gesture-based pointing devices and traditional ones in terms of efficiency, user experience etc. The abstract [1] of the paper reads: "It investigates the pros and cons for gesture-based interaction, giving insights into peoples preferences (epistemic actions) and performance. [1]

A Survey on Gesture Recognition Techniques and Applications by Rahal e tal. (2016): In this surveyed paper currently provided a collective, are giving increasing abstract, for the advances of recently proposed gesture recognition techniques in various fields like computer vision based methods and other accelerometer-based solutions or sensor space. It details the difficulties, applications and future directions in gesture recognition. [2]

Paper 3: (Detecting and Interpreting Mouse Gestures) The third paper by Jacob O. Wobbrock, Brad A. Myers in their work about detecting mouse gestures systematically implemented gaze independent eye-gesture interaction [22].

Zhang et al., A Survey on Gesture Recognition and Applications Hand Gesture Recognition: A Review (2012). This paper is a good survey covering most things that are tried in hand gesture recognition, techniques to the algorithms they may use very wide range of applications and challenges. This report covers an in-depth analysis of gesture recognition technologies across all the regions and key technology, verticals that are under process for its deployment. [4]

Chandra et al.(2012), Evaluation of Gesture Interaction Techniques for Hands-Free Text Entry: A Comparative Study. Study: Hock et al. (2018) used this dataset for a study that compares several gesture-based interaction techniques designed for hands-free text entry, It assesses the productivity and preference of a set of gesture-based input techniques for text-entry tasks. [5]

Link to the gesticulation system of Rahman et al (21) (2016): This original research article aimed at for gesture-based user interfaces. The post explores designing for gesture-based interactions, testing the user experience and many other aspects that it influence the design and implementation of gesture-based systems.[7]

A Survey of Gesture Recognition Techniques in ABUSHARIF(DWORD\_LONG bitwise ) Abusharif(byteslong) et al. C (2016) A comprehensive review on hand gesture recognition techniques, possible advancements and new integrated domains. It presents various techniques, characteristics and applications makes ode to limitations of some that provide insights on future trends in this area. [8]

Swipe Board: A Text Entry Technique for Ultra-Small Interfaces using Swipe GesturesRohit Ashok Khot, Marian Pittaro and Florian Floyd Müller 2018-05 (2014): Our previous work presented Swipe Board, a novel on-surface text entry technique utilizing swipe gestures in a forced feedback touchpad. It shows how gesture-based input could be used for good effect when text had to go into a limited interface. [9]

Gestures in the Air: Examining Strategies for 3D Gesture-Based Input Over Stereoscopic Cameras (Florian Eichler et al.) Stereoscopic Cameras for Depth-added Real-time Gesture Input (2017) This work researched the utilization of stereoscopic cameras to enable natural depth information in gesture based input. In our work, the focus is on exploring 3D gesture recognition with higher expressiveness and accuracy due to its promise. [10]

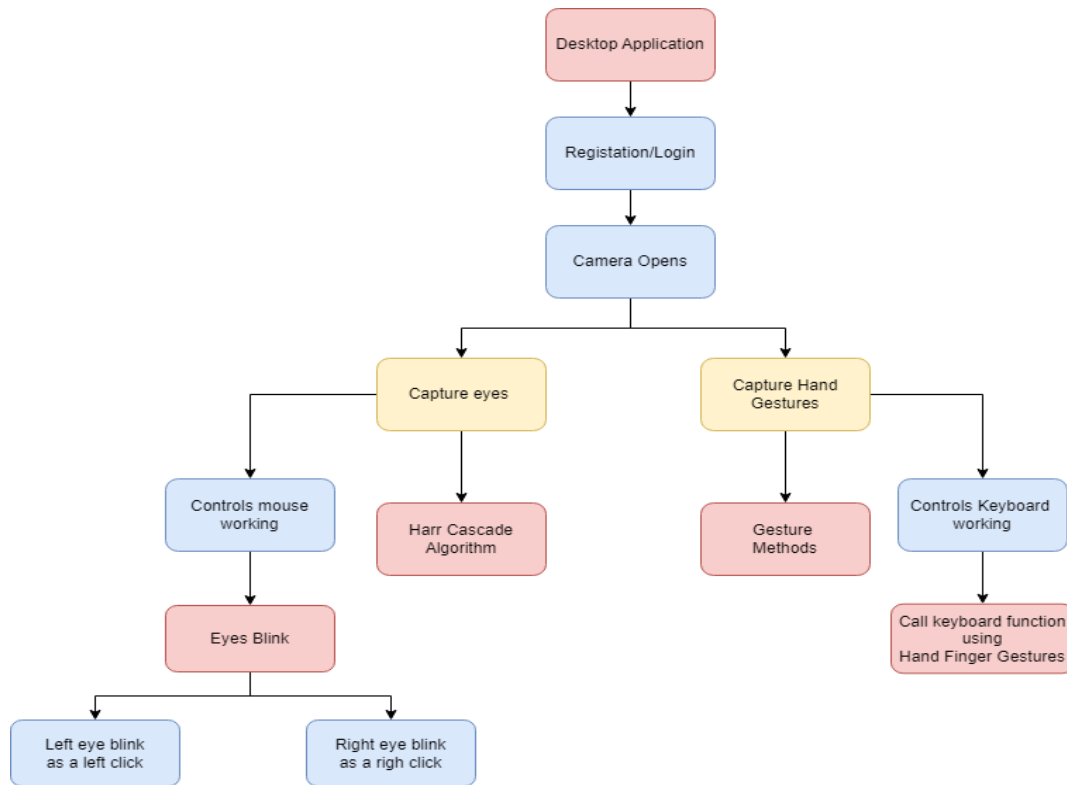
## III. PROPOSED METHODOLOGY

The development and implementation of a gesture-based mouse and keyboard system involve several key components and methodologies. The following are the primary steps and methodologies involved in creating a gesture-based interaction system:

Hand Tracking: The first step is to track and recognize the user's hand movements accurately Usually involves computer vision techniques or some other sensory technology like such as depth sensors or infrared cameras. The system captures and analyses the user's hand movements in real-time, allowing for precise tracking and gesture recognition.

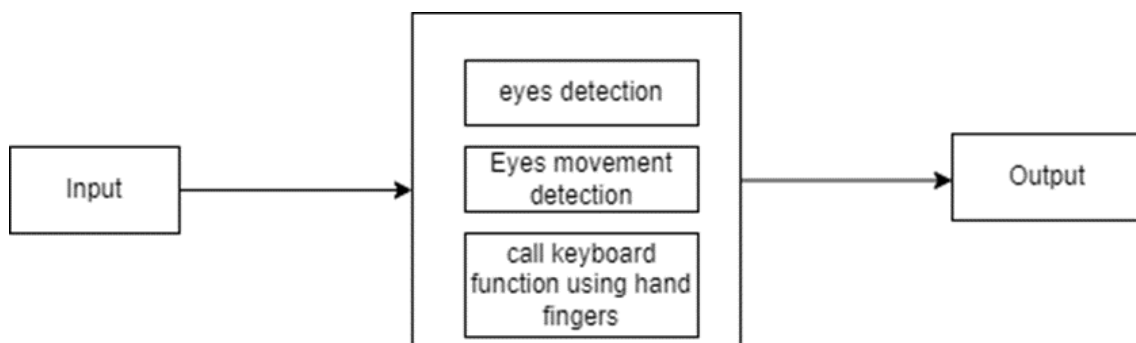


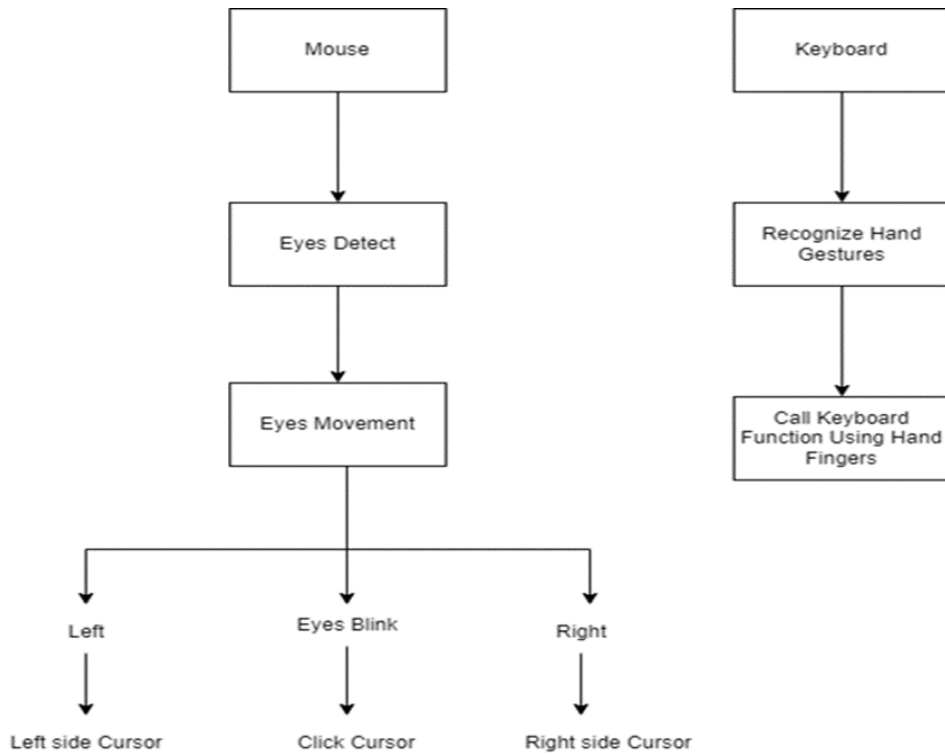
**BLOCK DIAGRAM:**



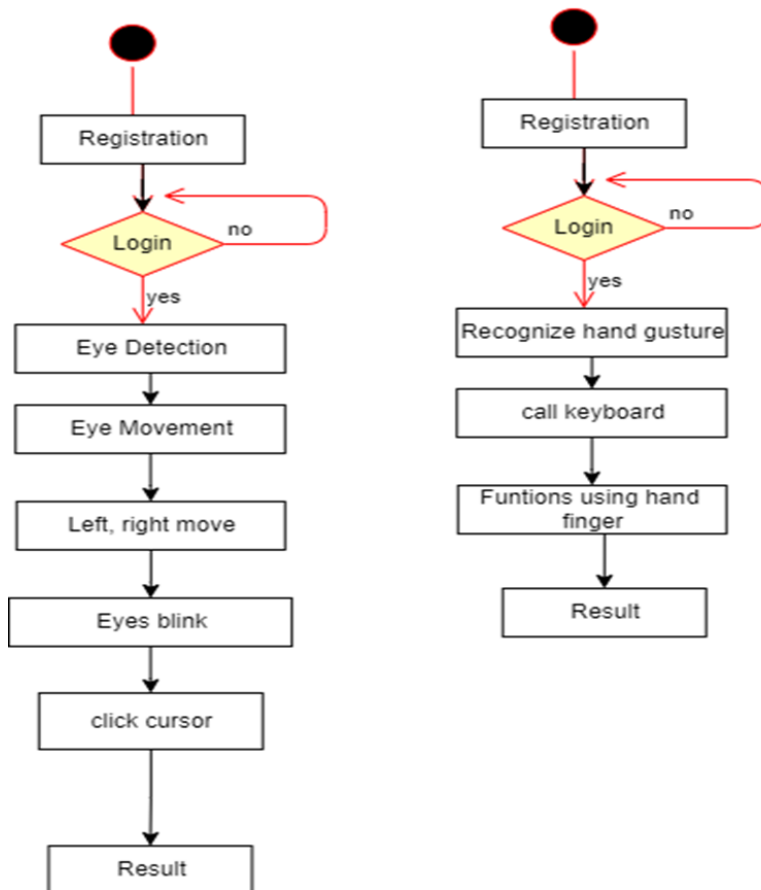
- 1) We worked on the eyes features in the proposed system using the haarcassade eyes algorithm xml file. using this method to operate on the mouse. Next, we practised our hand and finger movements while using the keyboard. harrcaded file analyses eyeball motions and detects them. Using hand gestures to examine the qualities of the fingers on the hand combining these two methods to develop keyboard and mouse ability.
- 2) Gesture Input Device: This component captures the user's hand movements and gestures. It can include various sensors such as cameras, depth sensors, or accelerometers to detect and track the user's hand motion accurately.
- 3) Gesture Recognition Module: The gesture recognition module processes the input data from the gesture input device and identifies specific gestures or hand movements. It employs algorithms and machine learning techniques to analyze the input and map it to predefined gestures or commands.

**Flowchart:-**





Activity Diagram:





Step 1: Start.

Step 2: Open the webcam on the laptop and show the image of a person.

Step 3: Face detection action is performed

Step 4: The system detects the eyes of a person

Step 5: After the above action system move on to the next operation.

Step 6: In the next step the system detects eyes and face through webcam of a laptop.

Step 7: With the help of eyes movement Cursor Will be moved

Step 8: Detect the hand gesture from the camera.

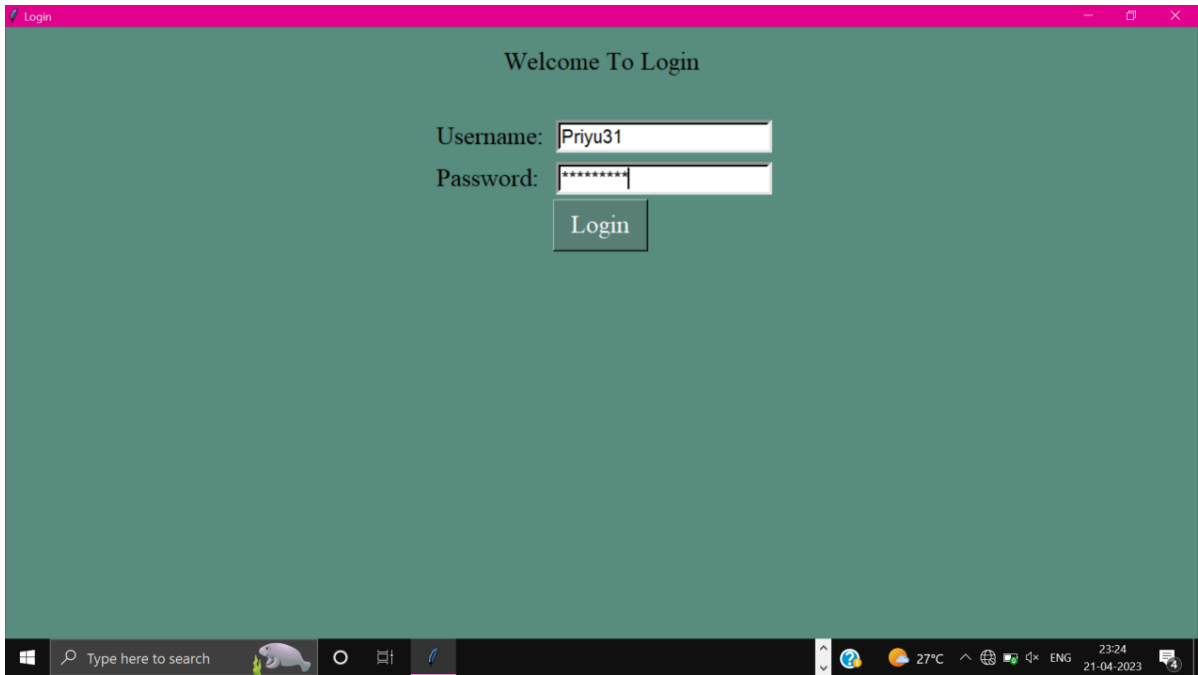
Step 9: With the help of hand gesture keyboard function will be done.

Step 10: Push Exit button.

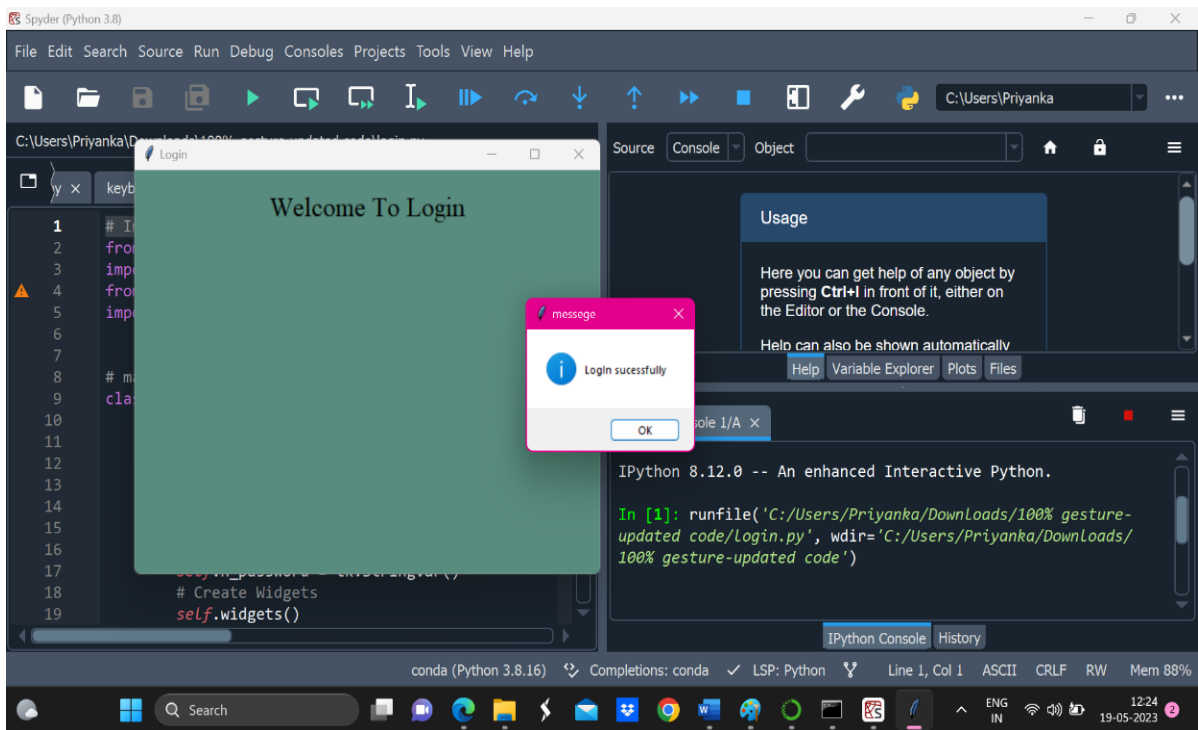
Step 11: End

#### IV. RESULT AND DISCUSSION

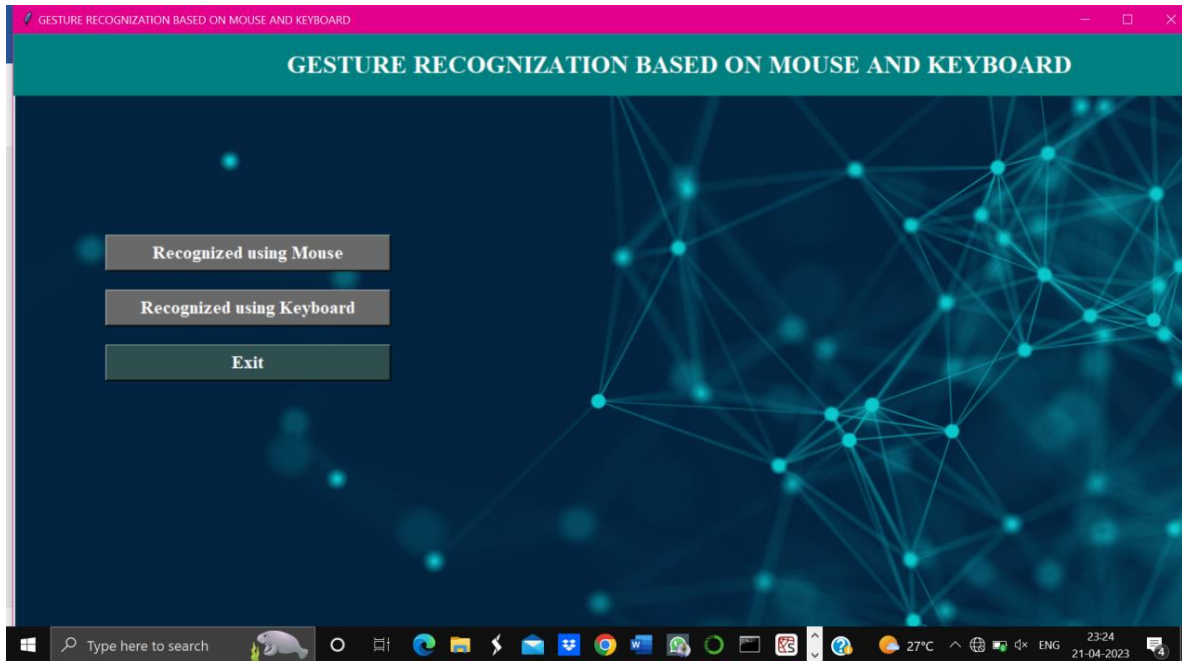
First desktop application will open & user registration process will be done. This registration data will save in DB SQLite software. Means whenever user login again his data will be checked and only, he will be given authorization.



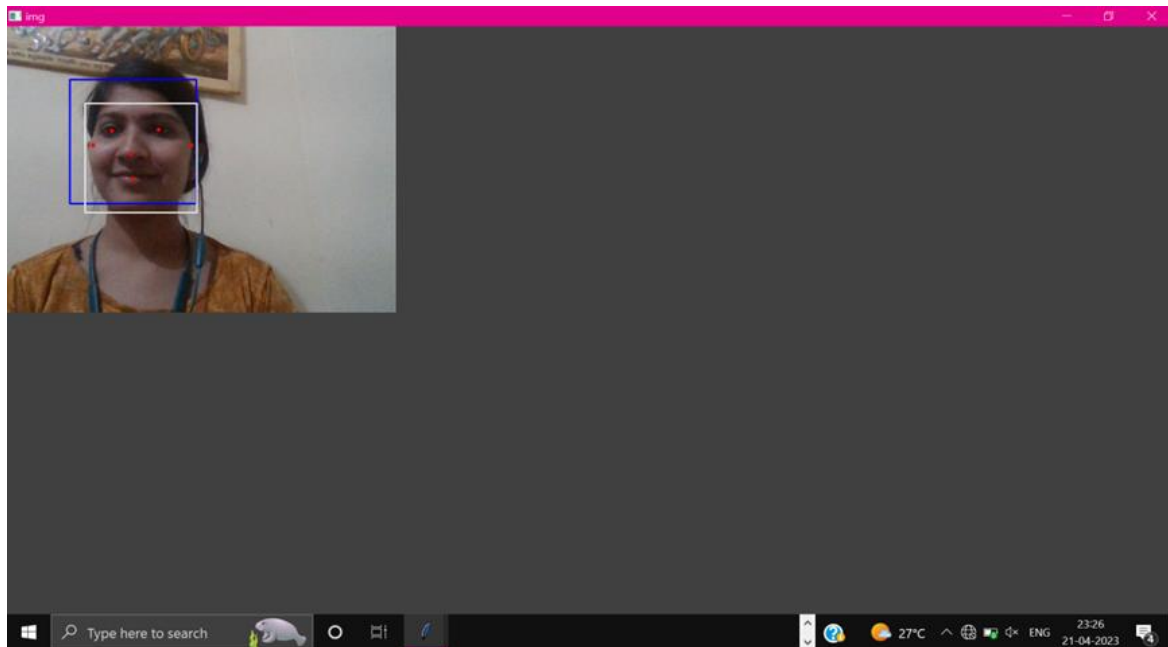
After registration the login window will be open. In this we need to put username and password.



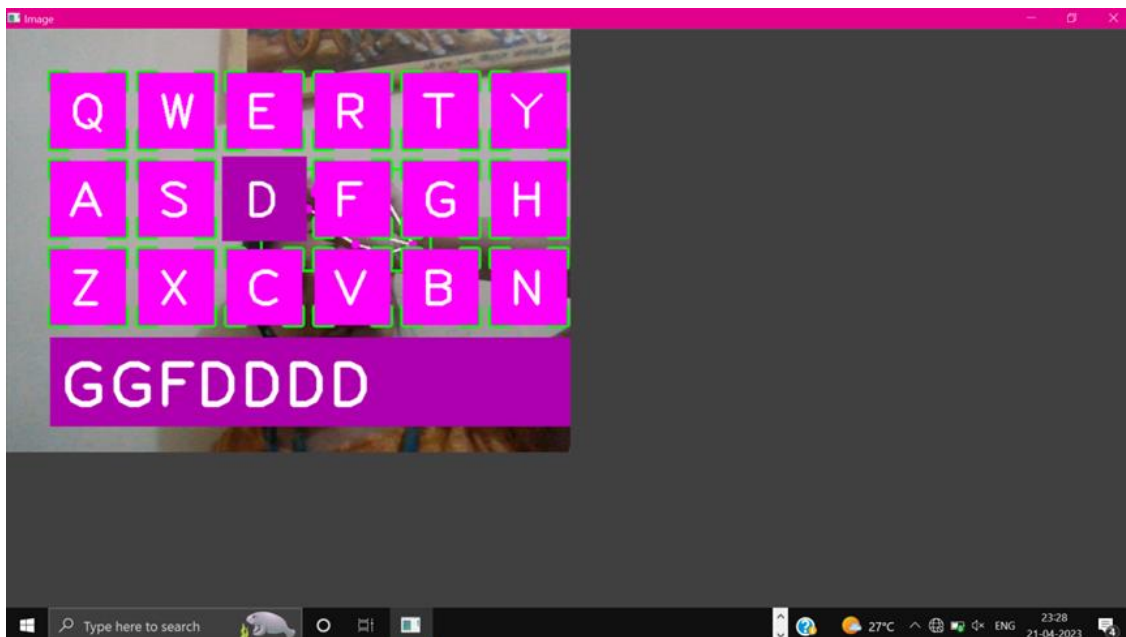
If user name and password is correct means we sure that user have authorize person otherwise login failed. Then next process will be done.



After login this window will be open. According to the user choice user choose any one of the option. If user click on mouse recognized tab, then mouse function will Done.



In this we see that camera will open and fetched eyes coordinate. According to our eyes movement cursor will be move.



In this we see that keyboard function will be done according to our hand gesture keyboard function will be done. Actually, in this camera fetch the coordinate of hand.

## V. CONCLUSION

To summarise, gesture-based mouse and keyboard technologies provide a totally different interface experience which is perhaps more natural complimented to most standard computing devices. These systems used different types of motion sensors and cameras to recognize hand- or body-movement gestures, many associated with mobile games applications in the beginning therefore allowing cursor control & input without an actual physical device like mechanically operated mouse / keyboard. In this project we can do the human and computer interaction. This project use by normal people for virtualization. One of the main advantages of gesture-based input is its potential for natural and immersive user experiences.

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