



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

# IJRSET

International Journal of Innovative Research in  
**SCIENCE | ENGINEERING | TECHNOLOGY**

# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 12, Issue 3, March 2023

**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA

Impact Factor: 8.423

 9940 572 462

 6381 907 438

 [ijirset@gmail.com](mailto:ijirset@gmail.com)

 [www.ijirset.com](http://www.ijirset.com)

# A Virtual Keyboard Implementation Basedon Finger Recognition

Rahulsing Vijaysing Sital<sup>1</sup>, Mohammed Arfat Abdul Karim Mujahid<sup>2</sup>,  
Sai Shrinivas Dornal<sup>3</sup>,Ritesh Rajesh Tarange<sup>4</sup>, Siddharam Rajshekhar Yalshetti<sup>5</sup>,  
Sangeeta Lagmanna Jadge<sup>6</sup>

Diploma Student, Department of Computer Engineering, A.G.Patil Polytechnic Institute, Solapur, Maharashtra, India<sup>1</sup>

Diploma Student, Department of Computer Engineering, A.G.Patil Polytechnic Institute, Solapur, Maharashtra, India<sup>2</sup>

Diploma Student, Department of Computer Engineering, A.G.Patil Polytechnic Institute, Solapur, Maharashtra, India<sup>3</sup>

Diploma Student, Department of Computer Engineering, A.G.Patil Polytechnic Institute, Solapur, Maharashtra, India<sup>4</sup>

Diploma Student, Department of Computer Engineering, A.G.Patil Polytechnic Institute, Solapur, Maharashtra, India<sup>5</sup>

Lecturer, Department of Computer Engineering, A.G.Patil Polytechnic Institute, Solapur, Maharashtra, India<sup>6</sup>

**ABSTRACT:** Researchers all across the world are currently focusing on making our devices more interactive and operable with minimum physical interaction. Thai researchers suggest an interactive computer system that employs computer vision to produce a virtual keyboard and mouse using hand motions alone. We may use a built-in camera or an external camera to track the image of different motions produced by the person's hand and executes mouse cursor operations such as right and left clicks, as well as moves the cursor, based on the different gestures. Furthermore, we may operate the console with various gestures, such as one finger to choose an alphabet and a four-finger motion gesture to do a swipe operation in either the left or right direction. This suggested system will function as a virtual keyboard and mouse without the usage of any wires or other external devices. The sole hardware component of this system is a camera for picture capturing, while the coding will be done in the Python programming language.

**KEYWORDS:** Hand Tracing, Finger counter, AI Virtual Mouse, AI virtual Keyboard, Gesture control.

## I. INTRODUCTION

Image processing is a branch of signal processing that can correspond to input and output images or video tapes as images or their various parameters. Gesture recognition and colorization is an image processing process. Recently, many gesture recognition methods have been proposed. Hand tracking has a variety of operations, including motion capture, human-computer interaction, and human behavior analysis. Different types of detectors and tracking gloves are used for detecting and tracking hand movements.

Instead of using more expensive sensors, simple webcams recognize gestures and track movements. Videoconferencing is all the rage right now. For this reason, most computer users use webcams on their computers, and most laptops have built-in webcams. The proposed webcam-based system may be suitable to eliminate the need for a mouse and keyboard. The process of interacting with a computer using gestures is a really fun and effective method of HCI.

There are many good surveys of this interest. With the increasing development of technology, the size of equipment is becoming more and more compact. Some devices have gone wireless and some devices have been idle. This article proposes a system that can operate some devices in the future, that is, the future of HCI. This offer concerns the development of a virtual mouse and keyboard using gesture recognition.

The end result is to use just a single camera instead of the traditional bias to control mouse cursor and keyboard functions. The virtual mouse only uses the camera as an intermediary between the user and the machine. It helps users interact with machines and control mouse functions without any mechanical or physical bias. Usually we use a mouse, keyboard or other very compact way to interact with the computer. Wireless polarization also requires power and connection technology, but in this article, the user's free hand is the only input option for using the webcam.

So it's a really interactive way to control the mouse cursor and the keyboard. The system implicitly replaces typical mouse and machine remote controls. The only obstacle is the lighting conditions. This is why the system is still not good enough to replace a traditional mouse, as most computers are used in low light conditions. People with severe dyskinesias, in particular, may have physical disabilities that severely limit their ability to control fine motor skills. They may therefore not be suitable for the classroom and communication with a normal keyboard and mouse.

## II. BACKGROUND

In this day and age, PCs have become an important part of life and are employed in various industries; nevertheless, the frameworks and techniques that were used to connect with PCs are old and have various flaws, which we shall discuss slightly later right now. As a result, a brand-new area known as Human Computer Interfaces has emerged to address these difficulties (HCI). Regardless of the fact that PCs have made significant progress in the two fields of Software and Hardware, the fundamental way in which Humans collaborate with PCs remains the same, utilising fundamental pointing gadget (mouse) and Keyboard or advanced Voice Recognition System, or possibly Natural Language handling in truly advanced cases to make this correspondence more human and simple for us.

The Hand movement's acknowledgement framework is our proposed endeavour to replace the key pointing devices used in PC to portray hand gestures. Next, the hand movement affirmation is practised by analysing the proximity of the component data. The input devices delivering the principal visual information fuse conventional camera, sound sframework camera, and ToF camera. The sound framework camera and ToF camera both provide importance information, making it simple to piece the hand region from the establishment to the extent of the significance map.

Right now, provide a skilled and effective approach for hand signal acknowledgement. Frameworks are the hand location to lessen the obstructions left by legacy frameworks, for example, mouse and Touchpad. The proposed framework employs hand motion, for the most parts no of fingers lifted within the locality of Interest to perform different activities, for example, Play, Pause; look for forward, slook for back word in video player. A static control board regulates the adaptability of the customer and restricts the customer's limit, just as a remote may be lost, dropped, or destroyed, however the physical closeness of the customer is required at the sight of action, which is a client confinement. The proposed framework can be used to control various sensitive boards, for example, HMI frameworks, Robotics Systems, and Telecommunication Systems, by utilising hand motions with assistance from programming by inside python utilising pyautogui module to encourage cooperation inside various elements of PC through the Camerato capture video outlines.

To begin, the hand location is detected from the initial images from the information devices. Following that, a fewtypes of highlights are deleted using the foundation subtraction approach. The palm and fingers are separated at that moment in order to perceive the fingers. Following the perception of the fingers, the hand motion may be organised using a simple principle classifier. The following is a list of the peculiarities of the suggested plan. (I) The major strangeness of the proposed approach is that the hand motion acknowledgment depends on the result of finger acknowledgment.

A keyboard consumes a lot of resources and is limited by its physical features. Also, discarded keyboards invariably contribute to environmental degradation. Hence, the touch screen is meant to replace the actual keyboard and thereby

decrease these faults. Unfortunately, the inbuilt digital keyboard on the touch screen takes up a significant amount of area, obscuring certain text. Also, due to regular use, the touch screen might become dirty by fingerprints and damaged over time by human fingernails. As a result, a new form of environmentally friendly virtual keyboard with fewer defects is required. In this thesis, the author creates a unique form of virtual keyboard that allows users to text on a sheet of paper at any fixed plane using their fingertips. Finger recognition is based on human skin tone and then the BWMORPH algorithm is employed to recognize the user's fingertip. If the user's fingertip has been on a key for a long period, the software will treat this key as an input. To show the usefulness of the suggested virtual keyboard, the experiments in this thesis use five different types of customized paper keyboards on a wall. To disregard the obstructions covering the paper keyboard, type without touching the keyboard. The experiment findings reveal that the total recognition rate of the proposed virtual keyboard is 94.62%. The suggested virtual keyboard can be put to use for a smartphone in the future. Additionally, once upgraded to allow ten-finger recognition, it may be applied to computers as a blueprint. Furthermore, machine learning might be integrated into our virtual keyboard to significantly increase its finger identification capability.

### III.LITERATURE REVIEW

A technique for controlling the on-screen cursor without a physical connection to a sensor is provided. This activity involves the identification and tracking of coloured caps on the fingers. For the same reason, other hand motions might be used in place of coloured caps. Mouse functions include single left click, double left click, right click, and scrolling. For various procedures, several colour combinations of caps are employed. The application allows you to change the skin colour range according to the individual and the surrounding lighting circumstances. By analysing the programme output at various hand movements, an approximate area ratio that is not being used by the hand in the convex hull is taken [1].

This paper's interaction system is made up of three parts: hand gesture segmentation, hand gesture tracking, and hand gesture recognition. Hand gesture segmentation is accomplished by removing the appropriate individual hand motion from a single frame of video, which is also the initial step in hand gesture recognition. It primarily contains varieties based on skin colour, edge detection, motion information, and statistical template, each of which has distinct advantages and limitations. The research employs a fusion technique to achieve hand motion segmentation in a complex context. In terms of hand gesture tracking, it is about real-time position and hand gesture tracking in video based on certain of their attributes, which is the first stage in hand gesture recognition [2].

Text generation is one of the most common computer activities, a straightforward operation that might be limiting for those suffering from severe neuromata illnesses like Amyotrophic Lateral Sclerosis (ALS), which can lead to Locked-in syndrome (LIS). Some people require augmentative and alternative communication technologies since they may only be able to communicate and connect with the outer world through eye movements. This study studies eye movement tracking-based interaction approaches and proposes a virtual keyboard that uses gaze detection as text input. It discusses the construction of the assistive keyboard's form identification algorithm, typed word voting from a Brazilian Portuguese vocabulary, and preliminary findings on the decoding method. [3]

We propose the use of an eye gazing system to show a virtual keyboard on a monitor, allowing users to enter certain words or short sentences. Disabled or handicapped persons have some motor function deficiency, thus they might write the phrases utilising eye gaze using this approach. Eye contact is a natural and simple connection for everyone. The technology comprises of a virtual keyboard application that is controlled by the user's sight. Hence, using this technology, users may readily share information with others. With this method, a pointer moves based on the users' eye gaze [4].

They suggested an I-Keyboard with DND. For the first time, I-Keyboard aimed to create a fully fictional keyboard that does not require calibration. Users may begin typing from wherever on the touch screen without having to worry about the form or position of the keyboard. Also, users are not required to understand anything prior to typing. We conducted a user research while gathering the largest dataset for the creation of I-Keyboard. We investigated user behaviour in an eyes-free ten-finger scenario with strict limitations. Although the models wander in location and shape with time, the user mental models consistently presented identical layouts as a physical keyboard. We created I-Keyboard and DND after proving their viability [5].

Virtual hand gesture recognition can help with industrial robot control, sign language translation, smart surveillance,

Hand gesture detection, visual environment manipulation, and rehabilitation equipment for those with upper extremity physical impairments. Virtual hand gesture detection systems, in addition to being unobtrusive, may be a natural way of communicating with machines, making them an essential type of input device. The capacity to consistently recognize gestures from numerous perspectives is a tough component of this technology [2].

According to a poll and a sign language research, the hand gesture is the most natural and easy way to communicate among the many gesture communication modalities. With the aid of recent developments in the field of computer vision and pattern recognition, real-time vision-based hand gesture detection is becoming more and more viable for Human Computer Interaction. [4].

There are several rapid access strategies for hand and mouse motions on laptops. With our technology, we could utilize the laptop or webcam to identify hand movements and control the mouse, as well as perform simple operations such as mouse pointer control, select and deselect using left click. The finished project is a "Zero Cost" laptop-based hand recognition system that uses basic algorithms to detect the hand, hand movements, and assign an action to each movement. The Python-based solution we're developing is considerably more responsive and straightforward to implement since Python is a simple language that is platform agnostic, adaptable, and portable, all of which are desirable traits in a programmer targeted at generating a Virtual Mouse and Hand Recognition System [8].

Hand Gesture recognizes forms and/or locations based on implementation to assign a task to the system. The learning process begins with observations or data, such as examples, direct experience, or teaching, in order to uncover patterns in data and make better judgements based on the examples we offer in the future. The major purpose of the study is to enable computers to learn without human intervention or assistance and to adapt their operations accordingly. A semi supervised machine learning approach is used in this system, which may considerably improve learning accuracy when the obtained data necessitates the use of skilled and suitable resources to train and learn from [11].

The technology replaces the basic pointing devices used in Computers to display hand gestures with a hand motion recognition system. The goal of this project is to provide a solution for a technological platform that automatically recognizes and categorizes sickness. Steps such as image loading, preprocessing, segmentation, extraction, and classification are used to identify illness. Plant infections are identified using pictures of the leaves [12].

#### **IV. PROPOSED SYSTEM**

The implementation process in the suggested system can begin when the user's gesture is collected in real time by the webcam, following which the acquired picture is treated with segmentation process to compare and separate the value of pixels to the values of the designated colour. Once the segmentation is complete, the resulting picture will be converted to a Binary Image (with just two colours, white and black), with white representing the detected pixels and black representing the remaining pixels. The mouse pointer will then be set in accordance with the position of the white pixels in the image, imitating the mouse cursor without the usage of our normal conventional mouse.

The Mouse will employ a convex hull approach for its operation, faults are recorded or read, and the mouse's features are mapped as a result of the use of these defects. The technique of this photo reputation approach specializes exclusively on flaws and conditional statements; the convex hull treats the distance between the palms as a defect, so it may be utilized for more than one gesture and mapping command. The approach utilized for this keyboard feature is a little different from the Convex hull method; right here, the hand function machine is employed, and the location of the hand is collected through the computer in the movie. A small digital keyboard is mapped in the open video window.

The approach used to categories the extracted feature is called Haar Cascade, and it is used to recognize objects. It is a machine-learning algorithm in which a cascade function is taught using a restricted number of both positive and negative pictures. Following that, it is utilized to find things in other photos. The Haar cascades classifier has various advantages, one of which is the time it takes to train the classifier; the strategy requires a lot of positive pictures, which are images with faces, as well as negative images, which are images without faces. Then, similar to

our convolutional kernel, features are retrieved from it.

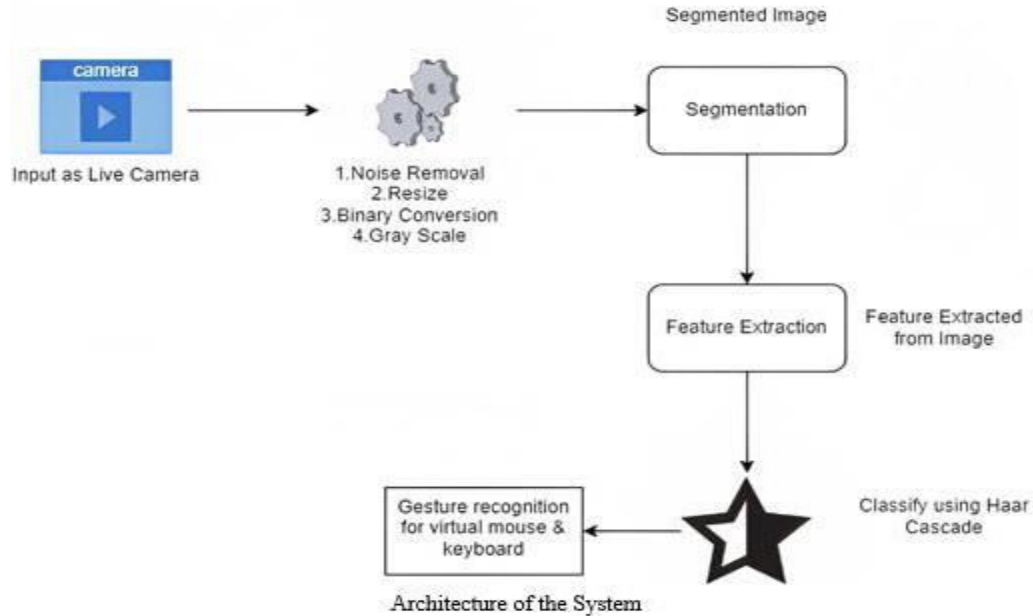


Fig. 1. Proposed System

Each individual feature might be a single value generated by subtracting the total number of pixels within the white and black rectangles. Instead of processing at each individual pixel, it divides the screen into sub-rectangles and creates array references for each one. The haar features are then calculated using these. It is critical to note that while identifying the object, almost every Haar characteristic is irrelevant since the only properties that count are those of the article. Yet, Adaboost is used to choose the best qualities from among hundreds of Haar features to represent an object. The system makes use of haar cascades as well as the OpenCV library. The OpenCV library keeps a database of pre-trained Haar cascades. The majority of those Haar cascades serve one of two functions: face discovery, eye discovery, mouth discovery, and full/partial body discovery.

The CVzone library in Python is used to implement the keyboard. CVzone is a computer vision application that uses the Media Pipe and OpenCV libraries to simplify image processing and AI operations. The Media Pipe library is used to apply mouse events. Media Pipe is a framework for creating machine learning pipelines for video and audio, both of which fall within the time-series data category.

## V. CONCLUSION

This study proposes a device for recognizing hand gestures and updating keyboard and mouse functions. This incorporates mouse cursor movement, click and drag with keyboard capabilities such as printing alphabets and other keyboard tasks. The method of pores and skin segmentation is used to separate the color/image of the hand from its backdrop. Remove the arm approach, which effectively resolves the situation of taking in the complete frame into the camera. In summary, the suggested set of rules may discover and detect hand gestures in order to function mouse and keyboard capabilities and provide a true global consumer interface. 3D printing, architectural designs, and evensurgical treatments may be performed from any location on the planet. This mission is simple to carry out, and its benefit may be extremely large in medical science where calculation is required, but it cannot be fully accomplished due to a lack of connection between computer and person.

## VI. FUTURE WORK

The system is completely autonomous. One of the finest characteristics is how simple it is to use. Future work will concentrate on algorithm optimization by combining the models developed and creating a whole virtual system handler that can manage the volume, brightness, and other functions as well as a virtual mouse and keyboard. It also



features keyboard enhancements. We intend to provide a caps-lock button. There is also a button that changes the keyboard characters to special characters so that they may be utilized as needed. With airport kiosk check-in devices, the virtual keyboard and mouse may be used combined for a touchless check-in experience. The passengers may input the PNR without touching the device and acquire their boarding passes. When such system is implemented.

#### REFERENCES

- [1] Vantukala VishnuTeja Reddy<sup>1</sup>, Thumma Dhyanchand<sup>2</sup>, Galla Vamsi Krishna<sup>3</sup>. “Virtual Mouse Control Using Colored Finger Tips and Hand Gesture Recognition” (2020 IEEE-HYDCON).
- [2] Jing-Hao Sun, Ting-Ting Ji, Shu-Bin Zhang “Research on the Hand Gesture Recognition Based on Deep Learning” 2020 12th International Symposium on Antennas, Propagation and EM Theory (ISAPE).
- [3] Rafael Augusto Da Silva and Antonio Cl “Algorithm for decoding visual gestures for an assistive virtual keyboard” IEEE Latin America Transactions (Volume: 18, Issue: 11, November 2020).
- [4] Kadir Akdeniz<sup>1</sup>, Zehra C, atalpe “Dynamic and Personalized Keyboard for Eye Tracker Typing” 2020 24th Signal Processing and Communication Application Conference (SIU)
- [5] Ue-Hwan Kim, Sahng-Min Yoo, and Jong-Hwan Kim, “I-Keyboard: Fully Imaginary Keyboard on Touch Devices Empowered by Deep Neural Decoder”, IEEE Transactions on Cybernetics ( Volume: 51, Issue: 9, September 2021).
- [6] Shah, P., Pandya, K., Shah, H., & Gandhi, J. (2019). Survey on vision-based hand gesture recognition. International Journal of Computer Sciences and Engineering, 7, 281- 288.
- [7] Panwar, M., & Mehra, P. S. (2011, November). Hand gesture recognition for human computer interaction. In 2011 International Conference on Image Information Processing (pp. 1-7). IEEE.
- [8] Abhilash, S. S., Thomas, L., Wilson, N., & Chaithanya, C. (2018). Virtual Mouse Using Hand Gesture. International Research Journal of Engineering and Technology (IRJET), 5(4), 3903-3906.
- [9] Ashok, M. A., Revathi, M. P., & Nirmal, B. (2020). FINGER RECOGNITION AND GESTURE BASED VIRTUAL KEYBOARD. Turkish Journal of Computer and Mathematics Education (TURCOMAT), 11(3), 2237-2245.
- [10] Nikhil, C. D. S., Rao, C. U. S., Brumancia, E., Indira, K., Anandhi, T., & Ajitha, P. (2020, June). Finger Recognition and Gesture based Virtual Keyboard. In 2020 5th International Conference on Communication and Electronics Systems (ICCES) (pp. 1321- 1324).



**INNO SPACE**  
SJIF Scientific Journal Impact Factor  
**Impact Factor: 8.118**



**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA



# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 **9940 572 462**  **6381 907 438**  **ijirset@gmail.com**



[www.ijirset.com](http://www.ijirset.com)

Scan to save the contact details