

## VIRTUAL KEYBOARD USING MACHINE LEARNING

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### ABSTRACT

This research introduces an innovative virtual keyboard system leveraging machine vision for human-computer interaction. The system utilizes hand tracking and recognition to facilitate virtual keyboard control without physical touch. This paper details the system architecture, implementation, and experimental results. This research introduces a novel approach to virtual keyboards using machine vision, providing an innovative and cost-effective solution for human-computer interaction. The system employs hand tracking and recognition to enable users to control a virtual keyboard without physical touch. The headway of innovation has prompted registering being coordinated into cell phones like cell phones and palm tops. Be that as it may, the conventional QWERTY console stays unaltered as the essential info gadget. This paper proposes a virtual console application that uses picture handling to make a visual ortrayal of a console. The virtual console will be useful and open by utilizing a camera to catch hand motions as composing inputs. A similar idea applies to the improvement of a virtual mouse that will involve finger acknowledgment as data sources. The camera will catch hand developments to control the mouse. The virtual console and mouse will be made by getting the picture of a console or mouse utilizing the camera, and catching the composing or mouse developments.

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### INTRODUCTION

The continuous evolution of technology and artificial intelligence has expanded computing from desktops and laptops to mobile devices, including smartphones and palmtops. In line with these advancements, this research presents the development of AirType, a unique virtual keyboard projected in the air. Unlike conventional virtual keyboards, AirType leverages hand and fingertip actions for intuitive letter typing. The project explores the vast field of artificial intelligence and contributes to the ongoing experimentation in the digital world. As the interest for enrolling environmental elements grows, new human-PC connection points are approved to supply different co-tasks among clients and machines. Anyway, acquaint for some humanwith PC joint efforts stays the binomial control center/mouse. We tend to are displaying here a state of the art development, that can't avoid being that the Virtual data contraption. Virtual console is an application that virtualizes hardware console with very amazing arrangements thusly permitting client to alter the plan in application. For example client will pick very amazing vernacular for editor or pick a particular configuration for negative behavior pattern applications. Client will try and style his own special plan in hardware variation. Virtual console is the new improvement in this field. The virtual console development makes use of camera and picture dealing with (picture handling) methods enabling client to utilize it away at any level surface using paper console. Virtual console allows us an opportunity to make a control enter in any of the inclined toward tongue on essentially every ongoing stage.

The properties of virtual control center being close to nothing and easy to use application make it a good response for content commitment transversely over different stages.

### Literature Survey

**Review of Literature of virtual keyboard:** Computer vision based mouse is to control the mouse tasks and recent challenges, erden et al. [1] have been investigated a camera and computer vision based technologies, such as image segmentation and gesture recognition. To overcome the limitations of erden et al. [3] this project, we have taken inspirational from the Hojoon Park which is inspired by computer vision-based technology that has the capability to control mouse movements in web camera. However, he used finger-tips to control the mouse cursor and the angle between the thumb and index finger was used to perform clicking actions. Chu-Feng Lien had used an intuitive method to detect hand motion by its Motion History Images (MHI). In this approach, the only fingertip was used to control both the cursor and mouse click. In his approach, the user needs to hold the mouse cursor on the desired spot for a specific period of time for clicking operation [2]. Kamran Niyazi et al used Web camera to detect color tapes for cursor movement. The clicking actions were performed by calculating the distance between two colored tapes in the fingers. In K N Shah et al. [9] have represented some of the innovative methods of the finger tracking used to interact with a computer system using computer vision. They have divided the approaches used in Human-Computer Interaction (HCI) into two categories.

- HCI without using interface.

- Moreover, they have mentioned some useful applications using finger tracking through computer vision.

In this study described the motivation and the design considerations of an economical head-operated computer mouse. In addition, it focuses on the invention of a head-operated computer mouse that employs two tilt sensors placed in the headset to determine the head position and to function as a simple head-operated computer mouse. One tilt sensor detects the lateral head-motion to drive the left/right displacement of the mouse. The other one detects the head's vertical motion to move up and down with respect to the displacement of the mouse. A touch switch device was designed to contact gently with operator's cheek. The operator may puff his cheek to trigger the device to perform a single click, double clicks, and drag commands. This system was invented to assist people with disabilities to live an independent professional life.

1. The modern mouse systems that can be manipulated remotely use color recognition technology. The current virtual mouse control technology allows us to easily manipulate the mouse cursor, The mouse can be used to click, and carry out other actions using a hand recognition system.
2. Abhilash S, Lisho Thomas, Naveen Wilson, and Chaitanya C suggested a system in their article that monitors the user's hand while donning color caps in two dimensions using only a low-resolution cameras a sensor.
3. The method was developed by Vijay Kumar Sharma, Vimal Kumar, Md. Iqbal, Sachine Tawara, and Vishal Jaiswal and allows the cursor to be controlled with only two fingers. They have put forth a device that allows users to move the mouse with just their two fingers and hand motions.

## METHODOLOGY

We have utilized the libraries and different elements of Python from which our Palm following Module and Composing on air with hand motions was completed effectively and advantageously with next to no dormancy or slacking. In the first place, we introduced the fundamental libraries through Python Mediator which were expected for coding of the ON AIR VIRTUAL Console. Then, we began building the code and with the procedure of experimentation technique we had the option to construct a fake working module of the given undertaking. Then, at that point, after heaps of upgrades and continually limiting the mistakes, we were at last ready to build the genuine code of our venture. At long last, for the better look of our task we utilized different tones inclusion and appealing and eye-getting techniques for the exquisite look of our console.

**Palm Tracking Module (PTM):** This technique was first to be tried. In this way, we made a module which would detect the palm, identify it and track the layouts on the fingers for certain filled circles as congruity between the bowing of the fingers. Likewise, we made a constant box around the palm which would change its aspects according to the end and opening of the palm continuously. Furthermore, we added an ongoing working FPS (Frames Per second) Show.

**Virtual Keyboard Working:** After effectively testing the Palm Following Module, we began to construct the Virtual Console for PC Machine by the assistance of Motions by utilizing Python Language. Using the PTM as dummy code, we built the Virtual Keyboard using the same Python Language and several packages like OPENCV ZONE, MEDIAPIPE, HAND TRACKING MODULE, PYNPUT, NUMPY AND TIME and we introduced new parameters in it such as KEYBOARD KEYS, BOX TO DISPLAY TEXTS AND REAL TIME FPS DISPLAY.

**OpenCV:** OpenCV is a computer vision library which contains image-processing algorithms for object detection. OpenCV is a library of python programming language, and real-time computer vision applications can be developed by using the computer vision library. The OpenCV library is used in image and video processing and also analysis such as face detection and object detection.

**Detecting Background:** Given the feed from the camera, the 1st thing to do is to remove the background. We use running average over a sequence of images to get the average image which will be the background too.

**Background Subtraction:** Background subtraction involves calculating a reference image, subtracting each new frame from this image and thresholding the result which results is a binary segmentation of the image which highlights regions of non-stationary objects. International Journal of Research Publication and Reviews, Vol 4, no 2, pp 979-984 February 2023 983.

**Contour Extraction:** Contour extraction is performed using OpenCV's inbuilt edge extraction function. It uses a canny filter. You can tweak parameters to get .....better edge detection.

**Convex Hull and Defects:** Convex hull points are most likely to be on the fingers as they are the extremities and hence this fact can be used to detect no of fingers. We are finding the deepest point of deviation on the contour.

**Fingertip Detection (Color Tape):** We estimate the locations of the user's fingertips (in image-space) based on geometrical features of the contours and regions obtained. Detect the locations of the user's fingertips. Detect whether any fingertips are in contact with the tabletop.

**Touch Detection:** We are given as input the estimated positions of the user's fingertips and must output which of those tips are estimated to be in contact with the keyboard mat. We used a technique called shadow analysis. For Keyboard Mapping Touch Point to Keystrokes In this we map touch to keystroke and recognized the character. For Mouse Tracking and Finger Detection – We are tracking and counting the no of finger. Gesture Recognition - Click gesture – Single click, Double click Keystroke-Send the keystroke to operating system.

**Problem Statement:** PC vision-based mouse can without much of a stretch be applied to the web administrations, brilliant home situation, robot control, and games. To that end following nonrigid movements from consecutive recordings have been an incredible interest to the PC vision local area. We grew up connecting with the actual articles around us. How we control these items in our lives consistently, we use motions not exclusively to communicate with objects yet to connect with one another and this presents to us a bit nearer to Human-object relationship by utilizing motion acknowledgment method. In this exploration still webcam has been utilized to perceive the motions. There is no requirement for 3D or sound system cameras or more exploration has additionally been tried on minimal expense 1.3-megapixel PC webcam. The work is devoted to a PC vision-based mouse that goes about as a connection point between the client and different registering gadgets in the dynamic climate. This paper presents the procedure to play out various mouse activities subsequently deterring the requirement for equipment utilized for connection between the client and the registering gadget. A similar methodology can be applied to vast errands like perusing pictures, messing around, changing T.V channels, and so forth. There is an edge an incentive for distance (in meters) between the client and camera which can additionally be fluctuated by the camera's goal. It implies if the subject who has any desire to be perceived with his hand motions in some climate, the subject needs to come near specific fixed distance to the camera. This exploration was finished on 1.3-megapixel webcam with a limit worth of 2m.

## Architecture

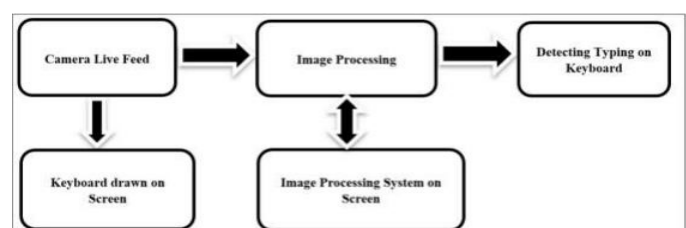


Fig. 1. Block diagram of Keyboard

- The keyboard will be displayed on the desktop screen.
- The camera will be available to capture live feeds of your fingerprint keyboard.
- Thus, by processing the Image, in real time the typed words on the keyboard will be detected.
- Those words will be displayed on the desktop.

### Flow Diagram

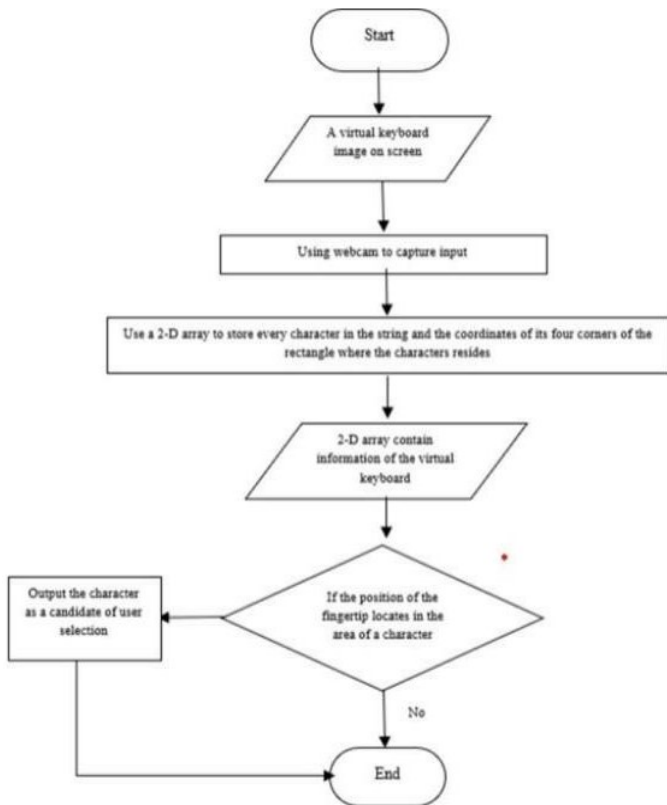


Fig. 2. Flow diagram of keyboard

The stream outline chart portrays the progression of capabilities which occur in the framework. It shows the progression of execution of how the order is given and that how the order is being taken care of and how the handling and the necessary result capability is performed.

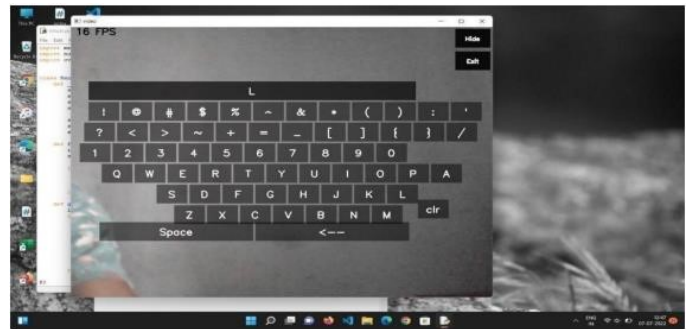
**Hardware and Software Details:** Hardware used in project are: Laptop with Operating system: macOS, Linux- Ubuntu 16.04 to 17.10, or Windows 7 to 10, with 2GB RAM (4GB preferable) Webcam – Web cam is used to capture and recognizes an object in view and tracks the user's hand gestures using computer vision techniques. As input, it sends the data to system.

The camera acts as digital eyes seeing what the user sees. It also tracks the movement of hand.

Software used in project are: -

- IDLE (Any) Library used in project are: - cv2:
- Capturing video using OpenCV NumPy:
- NumPy is a Python library used for working with arrays. Imutils:
- A series of convenience functions to make basic image processing functions such as
- translation, rotation, resizing, skeletonization, and displaying Matplotlib images
- easier with OpenCV and both Python 2.7 and Python 3. Json:
- Python has a built-in package called json, which can be used to work with JSON data.
- It's done by using the JSON module, which provides us with a lot of methods which among loads () and load () methods are going to help us to read the JSON file

### Modeling and Analysis



We get initial page with keyboard with two option show and exit button If click on show button it show the virtual keyboard



- It recognize the hand gesture and it print the letters and symbols virtually
- Virtual Keyboard Display and Hand gesture recognition
- Working of Keyboard and generating desired output.

### Future Scope

- The project's upcoming work will focus on enhancing the Fingertip Detection module to be insensitive to variations in lighting and determining the 3D posture of the panel for the purpose of augmenting 3D objects in reality.
- In the future, we will make use of other graphic features, like the character shape and icon feature, in the human-computer interface to identify touch events on the projected screen.
- Our future plan includes adding more functionalities such as expanding and reducing windows, closing windows, and so on, by utilizing the palm and multiple fingers.
- We aim to integrate voice recognition into the keyboard as well.

### RESULTS AND DISCUSSION

- The results indicate that if the vision algorithms can perform well in a range of environments, our system will function more effectively, potentially improving presentation experiences and reducing workspace.
- Our aim was to create this technology as affordably as possible, while also ensuring compatibility with a standardized operating system, with the potential to aid patients who lack mobility in their limbs.
- Our ON AIR VIRTUAL KEYBOARD is based on working of sensors and actuators
- There is no specific need of any kind of knowledge to run this software. It can be easily implemented with the basic idea of rules set to run the program.
- It is also used in 6th sense technology device in which it is not depends on surface
- We are able to access the keyboard layout drawn on a screen aligned and designed for camera window
- Further the images are pre-processed before the camera pop up window gets activated which will sharp or blur the image as per the needs of the situation
- Then the fingertips of user are detected as soon as there is a contact made with any of the character in the keyboard.

## CONCLUSION

Four facets of this project contributions are expressed. First, a plain piece of paper can be used to print our virtual keyboard. on paper, a wall, or another flat surface through projection. This results Because of its virtual nature, the keyboard is low use of resources. Second, you can use our virtual keyboard to put on any aircraft. Additionally, in combination with Additionally, this will soon be possible thanks to 3D projection technology. to project our virtual keyboard in the air. The final feature gives our People a simple method to personalize their own virtual keyboard. Our users can use handwritten keys because the virtual keyboard accepts them. One can make keyboards at home with just a pen and some paper. The user can alter the size and placement of the Letters as well. requirements, preferences. Our virtual keyboard is finally due to its ease of implementation and portability utilizing a paper keyboard and a standard camera.

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