

AI Virtual Keyboard and Mouse using OpenCV

Maahi Khemchandani^{1,*}, Kunal Junghare², Sahil Bote², Pinkesh Mohe²

Abstract

These days, PC vision has arrived at its pinnacle, where a PC can recognize its proprietor utilizing a straightforward program of picture handling. In this advanced stage, people are incorporating this vision into various aspects of daily life, such as face recognition, color identification, automatic vehicles, and so on. In this project, computer vision is used to create an optical mouse and console that uses hand signals. The camera of the PC will peruse the picture of various signals performed by an individual's hand and as indicated by the development of the motions the mouse or the cursor of the PC will move, even perform both ways click, utilizing various signals. Essentially, the console capacities might be utilized for a variety of signals, signals, such as utilizing one finger motion for letter set select and four-figure motion to swipe left and right. It will go about as a virtual mouse and console with no wire or outside gadgets. The main equipment part of the undertaking is a webcam, and the coding is done on python, utilizing Anaconda stage. Here, the convex frame deserts are first created, and then a calculation is created using the deformity estimations, and the mouse and console capacities are planned with the imperfections. Planning several of them with the mouse and console, the PC will comprehend the signal shown by the client and act as needs be.

Keywords: Computer vision, OpenCV, AI virtual mouse, AI virtual keyboard, webcam

INTRODUCTION

The computer webcam is catching the video of the individual sitting before the PC, there will be a little green box which will be created in the screen. The items shown in the green box will be handled by the code and coordinated with it. If it coordinates, a red shaded line will be created, indicating that the PC has recognized the item and that the mouse cursor can be moved by moving the item. This will not only help in the Computers frame of mind, but will also aid in the creation of a virtual computational experience [1].

Here, using hand motions, one signal will move the cursor, another signal will be used for right click, and yet another signal will be used for left click, similarly with a basic motion may accomplish the console capacity practically that could have been done on some console as an actual angle. When the realized motion is detected, the crate will display a possibly green box if the signal does not match [2].

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LITERATURE SURVEY

Intuition innovation is a signal based wearable connection point that interfaces the advanced data around us with the actual world and it permits us to utilize our normal hand motions to convey or collaborate with the computerized data. A few methodologies have been introduced on the idea of virtual mouse with various thoughts. The methodologies were used which included the idea of Image Processing and Image Acquisition. As

per the review, the adage is to make a virtual mouse which is mostly helpful for saving manual work. The future change can utilize complex mouse operations utilizing this straightforward picture handling method. By this idea, genuine world is interfacing and getting great with the advanced world utilizing the idea of this innovation referred to be as Sixth Sense [3]. Many works are finished utilizing Sixth sense innovation, and some also used IoT collaboration with it as the utilization of RFID labels and picture handling for potholes recognition to conquer mishaps, which is a primary issue in many pieces of the world [3]. One more work that is done in the comparative area is that trains independent vehicles utilizing block chain strategies for quicker and more secure insight [4], the independent vehicles can utilize a survey or rating framework which can assist them with piling up which street is protected and most brief, this way, a sound course can be made for the independent business be it vehicles or other independent vehicles [4, 5]. Image base one-time secret word is additionally an element these days to improve the security of One Time Passwords; it likewise incorporates AI calculations for location of picture OTP's [5, 6].

Smart image participation-based frameworks are additionally being used nowadays which makes the participation framework more mistake free and less tedious picture handling devices and calculation are utilized for understudy face detection [6, 7]. In the field of clinical science, the utilization of Artificial Intelligence is developing at an unprecedented speed; picture handling is utilized to order coronary episode attributes and diabetes characteristics in any event, utilizing skin pictures, the kind of contamination or harm can be tried [7]. The many works that have been done on this Sixth Sense Technology additionally included utilization of mouse by variety acknowledgment, which is working of the mouse with variety composed finger covers; the picture catches the variety and organizes or maps the mouse with its situation with deference with the area of the finger covers. The main issue was that the right snap and left click capacities were a lot of troublesome utilizing this cycle.

PROBLEM STATEMENT

The software on the virtual keyboard analyses those images in real time to establish the user's preferred input sequence. These researchers envisage a variety of uses for this technology: in some countries (for example, India), users speak a variety of languages, making actual keyboards for a variety of orthographies prohibitively expensive. Many languages can be easily supported using a camera-based keyboard. Users of smartphones and tablets may want to use a full-sized keyboard with their devices on occasion but are unwilling to bring a physical keyboard with them. Because most mobile devices include cameras, a camera-based keyboard could be a software-based solution to this issue [8].

It is no surprise that all technological devices have their own limitations, especially when it comes to computer devices. After the review of various types of the physical mouse and keyboards, the problems are identified and generalized. The following part describes the general problems that the current physical mouse and keyboards suffer:

- Physical mouse and keyboards are subjected to mechanical wear and tear.
- Physical mouse and keyboards require special hardware and surface to operate.
- Physical mouse and keyboards are not easily adaptable to different environments and their performance varies depending on the environment.
- Mouse and keyboards have limited functions even in present operational environments.
- All wired/wireless mouse and keyboards have their own lifespan.

It is fair to say that the virtual mouse and keyboards will soon to be substituting the traditional physical mouse and keyboards in the near future, as people are aiming towards the lifestyle where every technological device can be controlled and interacted remotely without using any peripheral devices such as the remote mouse, keyboard, etc. It not only provides ease, but it is also cost effective.

In general, we use a physical mouse or touchpads invented a long time ago for personal use in computers and laptops, but this project eliminates the need for external hardware by using human computer interaction technology to detect hand movements and gestures for mouse and keyboard movements and events [9].

PROPOSED SYSTEM

Mouse

It utilizes a raised structure process for its working, whereby abandons are caught or examined; utilizing these deformities, the elements of the mouse are planned. The course of this picture acknowledgment process exclusively centers around absconds and restrictive articulations, the arched body takes the hole of the fingers as imperfections, so it tends to be utilized for quite some time and planning orders. The accompanying advances are as follows [10]:

1. In the initial step, the web cam will begin and the video; and what is available before the camera should be visible.
2. In the following stage, the clients need to keep their hand in the expected line made on the screen.
3. In this progression, the different hand motions will be shown by the client, these signals will be not any sort of a motion but rather those which have been prepared for the PC all along.
4. If the motion coordinates, a green shaded line will be created and by moving the hand, the mouse cursor will likewise move.
5. There are all out four different sorts of motion, one is utilized to move the cursor, another is utilized to do the right snap, another is utilized for left click, and one more motion for looking all over.
6. The motion thus shows the imperfections which thus help in left and right snap choices defect=5 then right snap, defect=3 then left click.

Keyboard

The cycle utilized for this console work is a bit not quite the same as the convex structure process, here the hand position framework is utilized, that is, the video that is catching utilized the place of the hand, is caught by the PC. In the open video window, a small virtual console is planned. Utilizing the hand position method, the console capacities can be chosen which have been planned, and utilizing this interaction, the console work is executed, a mathematical capacity is utilized to pass judgment on the place of the hand and transform it into a grid area which makes the position unmistakable for the PC. The accompanying advances are followed for the utilization for signal and its keyboard capacities:

1. In the initial step, the web cam will open, and the client can see the camera window.
2. The letter sets and other console fundamentals are found in the red lines.
3. With an open palm, the console can be moved passed on to right to get every one of the letters in order and console capacities.
4. By putting the finger over the assigned key, they can type the expected letters in order or console capacities.

Flowchart

1. A keyword will display on the screen when we run the software.
2. Then we catch each casing of virtual console video. After that, we search fingertips in each frame.
3. Then we dissect the edges one by one. After analyzing, we search for a particular key which comes nearby of our fingertips.
4. Then we check whether that key is pressed or not.
5. Then break down their position.
6. Then we check whether that key is squeezed or not.

7. After investigating, we look for a specific key which comes close to close our fingertips
8. If the key is squeezed, then that specific person will appear.

DETAILS OF HARDWARE AND SOFTWARE

Software is a collection of codes loaded on your computer's hard disc, whereas computer hardware is any actual component utilized in or with your system.

Software Requirements

- Python 2.7: It is a broadly useful language, meaning it tends to be utilized to make a wide range of projects and is not particular for a particular issue.
- PyCharm IDE: It is a Python Integrated Development Environment (IDE) that includes a wide range of necessary tools for Python developers that are tightly integrated to create a pleasant environment for productive Python, web, and data science development.

IMPLEMENTATION

Mouse

The techniques utilized in each and all aspects of the framework proposed in this study is understood independently.

Camera

The framework works on the casings caught by the webcam on the PC machine or implicit camera on a PC. By making the video catch object, the framework will catch video involving webcam continuously. To utilize a solitary camera with this framework, the gadget record would be "0". To add extra camera, gadget list would be 1, 2, etc. This camera will catch outline by casing and will pass it to the framework as shown in Figure 1.

Capturing

By utilizing a limitless circle, the webcam catches every single casing till the program end. The edges from the ongoing video are handled from BGR to HSV variety space, as shown in Figure 2.

Color Detection and Masking

In this proposed framework, variety recognition is finished by distinguishing variety pixels of fingertips with variety covers from the edges that were caught by the webcam. This is the underlying and crucial stage of the proposed framework. The result of this progression will be a grayscale picture, where the force of the pixels contrasts the variety cap from the remainder of the edge and the variety cap region will be featured. Then square shape jumping boxes (veils) will be made around the variety cap and the variety cap will be followed. The motion will be identified from the following of these variety covers.

Variety Detection and Masking

In this proposed framework, variety discovery is finished by distinguishing variety pixels of fingertips with variety covers from the edges that were caught by the webcam. This is the underlying and crucial stage of the proposed framework. The result of this progression will be a grayscale picture, where the force of the pixels varies the variety cap from the remainder of the edge and the variety cap region will be featured. Then, at that point, square shape bouncing boxes (covers) will be made around the variety cap and the variety cap will be followed. The motion will be recognized from the following of these variety covers.

MOTION RECOGNITION

Mouse Movements

The focal point of two recognized variety items is calculated first, followed by the directions of the focal point of the identified square form. To make a line between two facilitates, the inherent OpenCV work is utilized and to recognize midpoint condition given underneath is utilized as shown in Figure 3:

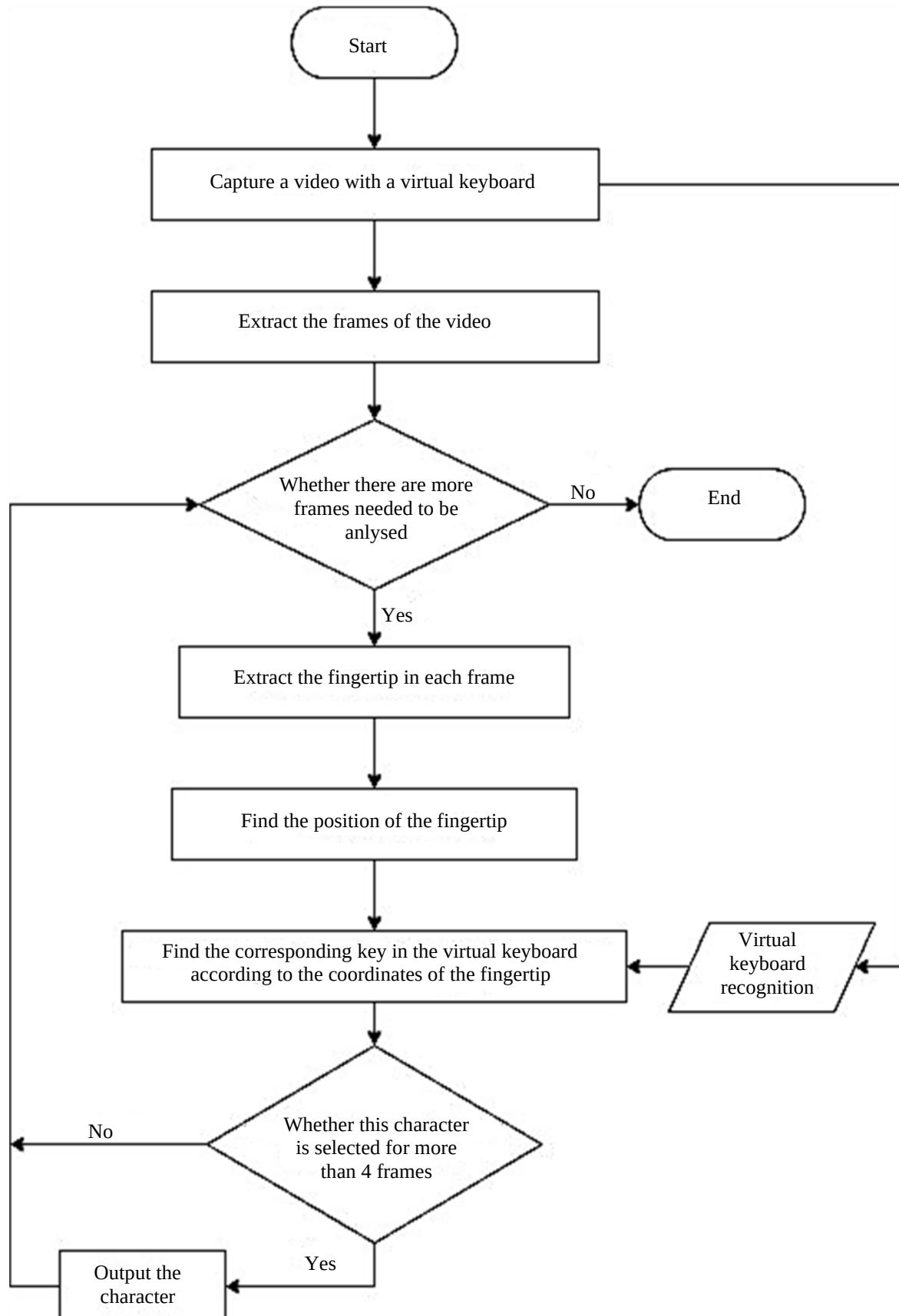


Figure 1. Flowchart for process of execute program for Keyboard.

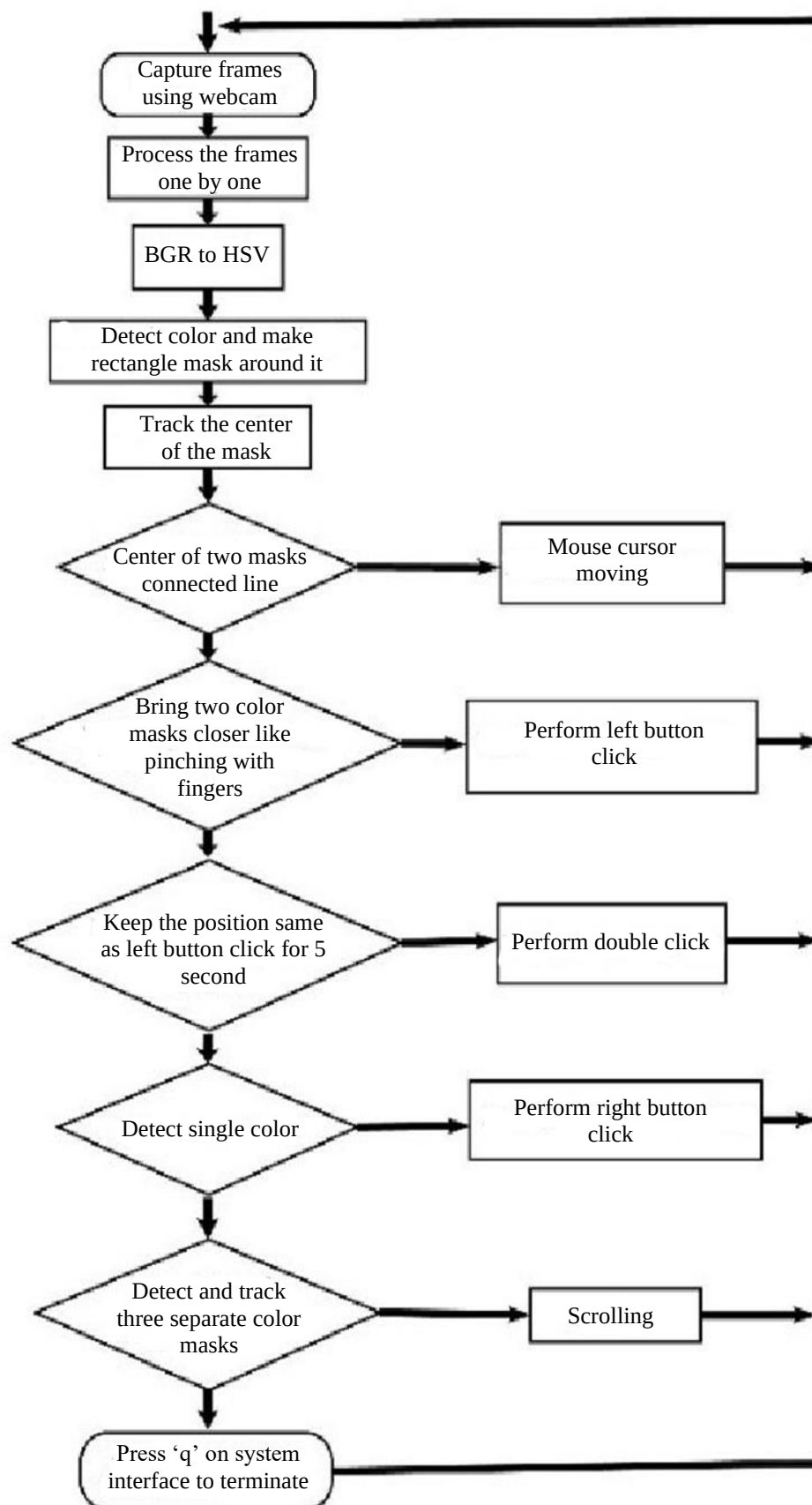


Figure 2. Flowchart for process of execute program for Mouse.

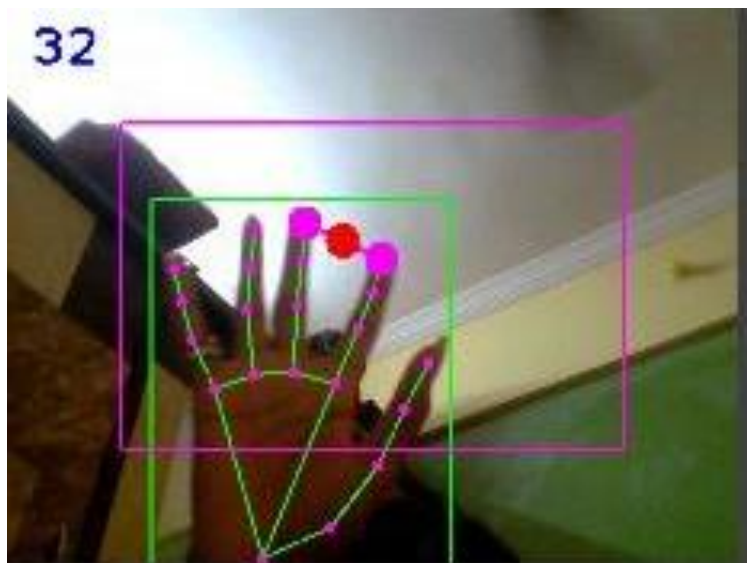


Figure 3. Hand Capturing.

This midpoint is the tracker for the mouse pointer and the mouse pointer will follow this midpoint. In this framework, the directions from camera caught outline's goal is changed over completely to screen goal. A predefined area for the mouse is set, so when the mouse pointer arrives at that position, the mouse began to work, and this might be called open motion. This permits the client to control the mouse pointer.

Mouse Clicking

The proposed framework involves close signals for clicking occasions. At the point when the square shape bouncing boxes draw nearer to another square shape, jumping box is made with the edge of the following bouncing boxes. When the recently made jumping box becomes 20% of its creation time size, then the framework performs left button snap, and it tends to be clicked. By standing firm on this footing for more than 5 sec, the client can play out a Double snap. Furthermore, for the right button click, again the open motion is utilized. To play out the right button click, the single finger is adequate. The framework will distinguish one fingertip variety cap then it plays out a right button click.

Keyboard

Using the hand position system, 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 has been mapped. The miniature keyboard is red in color and is easily accessible. By putting the Figure 4 parallelly with the digits or alphabets, the keyboard functions will take place.

Sudden Movements

Any quick movement of the hand or object in front of the camera will not be considered a detectable object because the program has a 1 sec delay in deciding whether it is a detectable object or not. As a result, sudden movement will not be regarded an input. In terms of printing an alphabet twice, use gesture for once then give a 1 sec delay and then show the similar gesture again, this will not confuse the program that it is a similar input and would prohibit the program in taking it as a garbage value.

RESULTS

Mouse

As shown in Figures 5 and 6, our hand is detected and we are moving the cursor with our fingers.

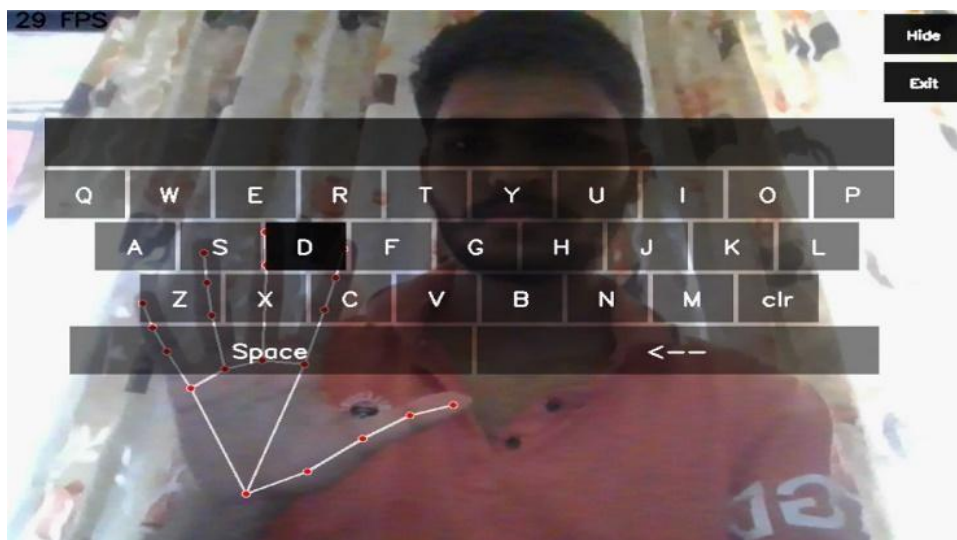


Figure 4. Virtual Keyboard.

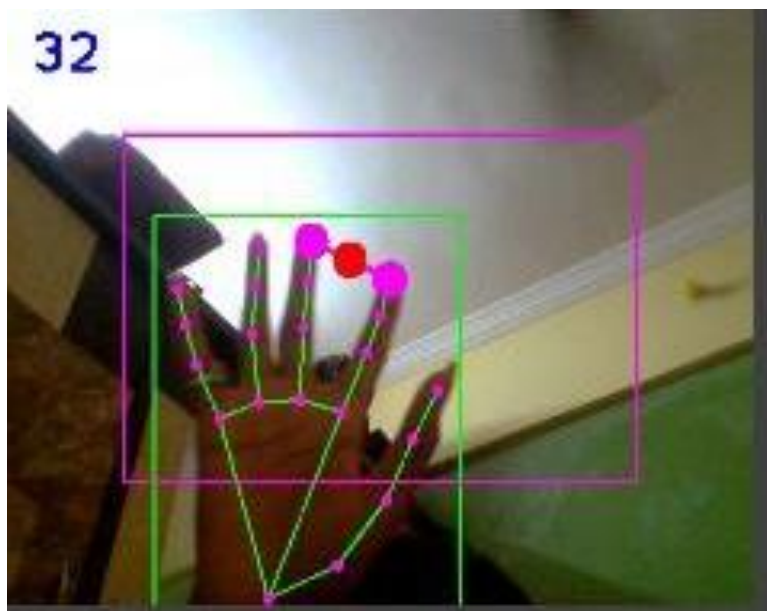


Figure 5. Hand is getting mapped.

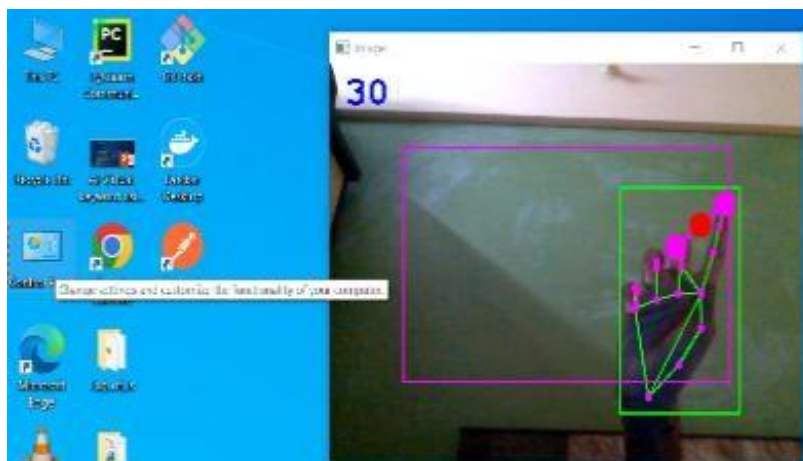


Figure 6. Virtual mouse using OpenCV.

Keyboard

As shown in Figures 7–9, a virtual keyboard detects our hand using a hand tracker module and whichever key stroke we press.

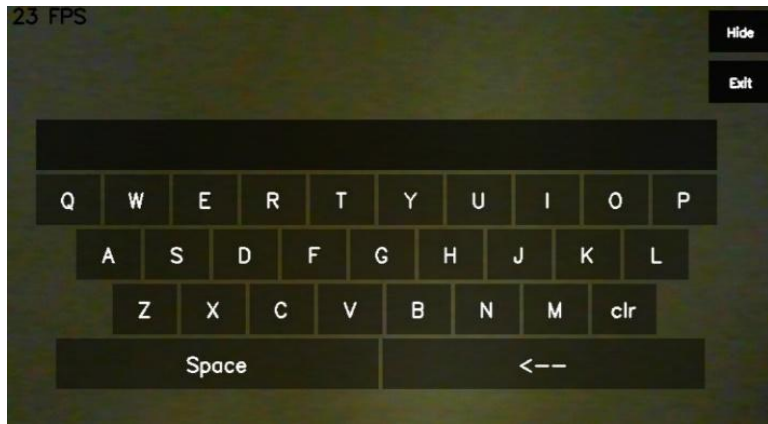


Figure 7. Keyboard sample.

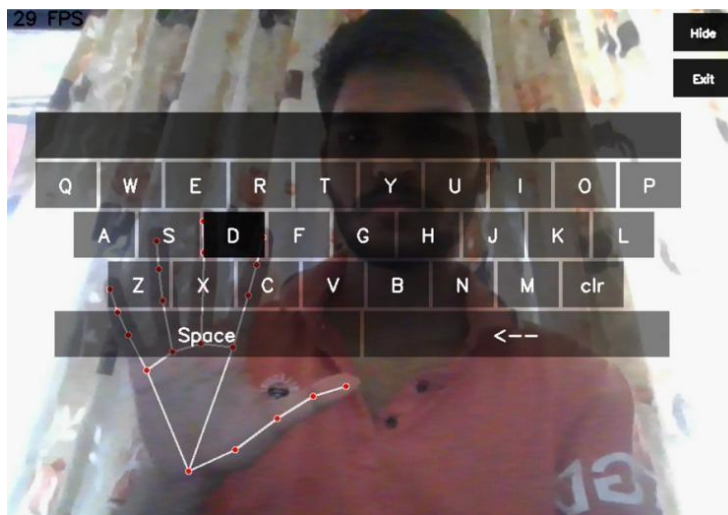


Figure 8. Virtual keyboard.

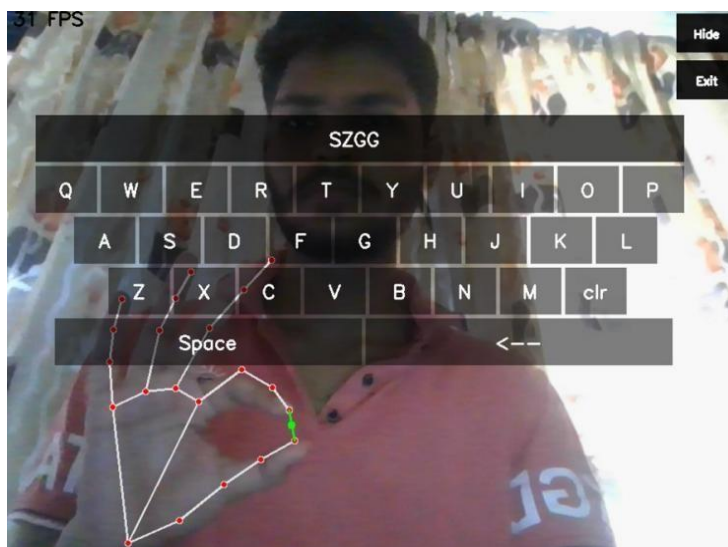


Figure 9. Virtual keyboard with letters.

CONCLUSION

This study is proposing a framework to perceive the hand motion and supplant the mouse and console work. This includes mouse cursor creation, drag and snap with console features such as printing letter sets and other console capabilities. The course of skin division is used to isolate the variety/picture of hand with its experience. Eliminate arm strategy, which addresses what is happening of taking into the entire body into the camera. In general, the proposed calculation can distinguish and perceive hand motion, allowing it to work mouse and console highlights and create a genuine UI. 3D printing, architectural drawings, and, in any case, clinical activities from anywhere to everywhere. This task can be effectively applied, and its application can be exceptionally huge in clinical science where calculation is expected yet could not completely be executed because of absence of human PC collaboration.

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