HCI WITH HAND GESTURE RECOGNITION USING MACHINE LEARNING ALGORITHMS

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Abstract

Hand Gesture Recognition is a project that shows a novel way to control mouse movement with a real-time camera/web camera. Our idea is to employ a camera and computer vision technologies to manage mouse tasks (clicking and scrolling), and we demonstrate how it can do all that existing mouse devices can. In this project, we implement an interactive computer system that can function without the usage of a keyboard or a mouse. Hand Gesture Recognition plays a key role in human-computer interactions. To implement this project, all we need a working webcam and three main algorithms that are, mediapipe, OpenCV and autopy. Media pipe is employed for hand tracking, OpenCV for image processing and drawing and last Autopy for controlling the mouse movement and its functioning

1. INTRODUCTION

A Computer Mouse is an input device that helps to point and to interact with whatever that is being pointed. There are so many types of mouse in the current trend, there's the mechanical mouse that consists of a single rubber ball which can rotate in any direction and the movement of the pointer is determined by the motion of that rubber ball. Later the mechanical mouse is replaced by the Optical Mouse. Optical Mouse consists of a led sensor to detect the movement of the pointer. Years Later the laser mouse was introduced to improve the accuracy and to overcome the drawbacks of the Optical Mouse.

Later as the Technology has been increased drastically wireless mouse was introduced so as to enable hassle free movement of the mouse and to improve the accuracy. No Matter how much the accuracy of the mouse increases but there will always be limitations of the mouse as the mouse is a hardware input device and there can be some problems like mouse click not functioning properly ad etc., as the mouse is a hardware device like any other physical object even the mouse will have a durability time within which is functional and after its durability time we have to change the mouse.

As the technology increase everything becomes virtualized such as speech recognition. Speech Recognition is used for recognition and translation of the spoken language into text. Thus, Speech Recognition can replace keyboards in the future, Similarly Eye Tracking which is used to control the mouse pointer with the help of our eye. Eye Tracking can replace mouse in the future. The paper highlights a brief study on speech recognition technology, describing the various processing stages and results .

Hand Gesture Recognition plays a key role in human-computer interactions Python programming language is used for developing

the AI virtual mouse system, and also, OpenCV which is the library for computer vision is used in the AI virtual mouse system. In the proposed AI virtual mouse system, the model makes use of the MediaPipe package for the tracking of the hands and for tracking of the tip of the hands, and also, some packages were used for moving around the window screen of the computer for performing functions such as left click, right click, and scrolling functions.

Since the computer technology continues to grow up, the human computer interaction is increasing enormously. Nowadays most of the mobile phones are using touch screen technology. However, this technology is still not cheap for using it on desktop systems. Creating a virtual human computer interaction device such as a mouse or a keyboard using a webcam and a computer vision techniques can be an alternative way for touch screen.

In this study, finger tracking based virtual mouse application has been designed and implemented using a regular webcam .The motto was to create an object tracking application to interact with the computer, and to develop a virtual human computer interaction device.It's no surprised that every technological devices have its own limitations, especially when it comes to computer devices. After the review of various type of the physical mouse, the problems are identified and generalized. The following describes the general problem that the current physical mouse suffers:

Physical mouse is subjected to mechanical wear and tear. Physical mouse requires special hardware and surface to operate. Physical mouse is not easily adaptable to different environments and its performance varies depending on the environment. Mouse has limited functions even in present operational environments. All wired mouse and wireless mouse have its own lifespan.

Hand Gesture Recognition plays a key role in human-computer interactions. As we can see that there are so many new Technological advancements happening such as biometric authentication which we can see frequently in our smart phones, similarly hand gesture recognition is a modern way of human-computer interaction i.e., we can control our system by showing our hands in front of webcam and hand gesture recognition can be useful for all kinds of people. Based upon this idea this paper is presented. This paper provides a detailed explanation to the algorithms and methodologies for the color detection and virtual mouse

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2. LITERATURE SURVEY

1. Blue Eyes Intelligence Engineering and Sciences Publication

Geopolymer Concrete (GPC) is the most promising and novel concreting technology which primarily focuses on the eco-friendly aspects. In this work, the mechanical properties of fly-ash based GPC which includes compressive strength, split tensile strength and non-destructive testing methods like UPV and rebound hammer tests results will be examined and analyzed based on the different mix parameters for 8 mixes. The main varying parameters of the mix are alkaline solution ratio and concentration and binder proportions. Based on the optimum mix from 8 normal GPC mixes, one mix will be

studied under the granite powder replacement. The granite powder is utilized for the partial replacement of binder for the 5%, 10%, 15%, and 20% of the binder volume.

2. Contested Collective Intelligence: rationale, technologies, and a human-machine annotation study

We propose the concept of Contested(Collective(Intelligence((CCI)(as a distinctive subset of the broader Collective Intelligence design space. CCI is relevant to the many organizational contexts in which it is important to work with contested knowledge, for instance, due to different intellectual traditions, competing organizational objectives, information overload or ambiguous environmental signals. The CCI challenge is to design sociotechnical infrastructures to augment such organizational capability.

Saurabh Singh, and Pooja Kumari in 2010 proposed a study on "A Real-Time Hand Gesture Recognition System Using Motion History Image." The main limitation of this model is more complicated hand gestures. Lisho Thomas and Naveen Wilson in 2018 proposed "Virtual Mouse Using Hand Gesture" where the model detection is based on colors To meet the increasing importance of human-computer interaction (HCI), several mice have been created, from the basic office mouse to an extreme gaming mouse. Because they aren't as ecologically friendly as they seem to be, these gadgets have several drawbacks. For example, you'll need a flat surface and a certain position to utilise the mouse's functions. As a result, part of this technology is useless when remotely communicating with computers because of connection length constraints.

Multi-point Interactive Whiteboards may be created with the Wii- mote [4]. Wii-mote controller, Microsoft.NET framework, Wii-mote Connect, and Wii-mote Whiteboard software are all required for this setup to operate. An IR pen and 1024 x 786- pixel beamer are also required. The Wii-mote controller tracks the whiteboard's infrared source, which sends data to the PC via Bluetooth. Multi-touch teaching stations, an interactive whiteboard and a stylus input conversion tool, are all part of the platform.

A hand gesture cannot be used to reach the monitor's display screen from a distance. Even though this is what it mainly seeks to do, the breadth is only limited to the virtual mouse region. In the present virtual mouse control system, the mouse cursor, left-click, right-click and drag are controlled by a hand recognition system.

Abolishing the practice of hand recognition will be the new standard in the future. Even though a variety of hand recognition systems are available, Only a few movements are given for each hand-made shape, which leads to a great deal of ambiguity and makes the "still hand" difficult to grasp. It's becoming more difficult to justify using a mouse in the modern world as technology advances.

3. PROBLEM STATEMENT

A Computer Mouse is an input device that helps to point and to interact with whatever that is being pointed. There are so many types of mouse in the current trend, there's the mechanical mouse that consists of a single rubber ball which can rotate in any direction and the movement of the pointer is determined by the motion of that rubber ball. Later the mechanical mouse is replaced by the Optical Mouse. Optical Mouse consists of a led sensor to detect the movement of the pointer. Years Later the laser mouse was introduced to improve the accuracy and to overcome the drawbacks of the10 Optical Mouse. Later as the Technology has been increased drastically wireless mouse was introduced so as to enable

hassle free movement of the mouse and to improve the accuracy. No Matter how much the accuracy of the mouse increases but there will always be limitations of the mouse as the mouse is a hardware input device and there can be some problems like mouse click not functioning properly ad etc., as the mouse is a hardware device like any other physical object even the mouse will have a durability time within which is functional and after its durability time we have to change the mouse

Limitations

The mouse is a hardware device like any other physical object even the mouse will have a durability time within which is functional and after its durability time we have to change the mouse. There will always be limitations of the mouse as the mouse is a hardware input device and there can be some problems like mouse click not functioning properly.

4. PROPOSED SYSTEM

As the technology increase everything becomes virtualized. such as speech recognition. Speech Recognition is used for recognition and translation of the spoken language into text. Thus, Speech Recognition can replace keyboards in the future, Similarly Eye Tracking which is used to control the mouse pointer with the help of our eye. Eye Tracking can replace mouse in the future. Gestures can be in any form like hand image or pixel image or any human given pose that require less computational difficulty or power for making the devices required for the recognitions to make work. Different techniques are being proposed by the companies for gaining necessary information/data for recognition handmade gestures recognition models. Some models work with special devices such as data glove devices and color caps to develop a complex information about gesture provided by the user/human.

Advantages :

Virtual Mouse using Hand gesture recognition allows users to control mouse with the help of hand gestures. system's webcam is used for tracking hand gestures. Computer vision techniques are used for gesture recognition. OpenCV consists of a package called video capture which is used to capture data from a live video. The main thing we need to identify are the applications the model is going to develop so the development of the mouse movement without using the system mouse

5. DESIGN

System design is transition from a user oriented document to programmers or data base Personnel. The design is a solution, how to approach to the creation of a new system. This is composed of several steps. It provides the understanding and procedural details necessary for implementing the system recommended in the feasibility study. Designing goes through logical and physical stages of development, logical design reviews the present physical system, prepare input and output specification, details of implementation plan and prepare a logical design walkthrough.
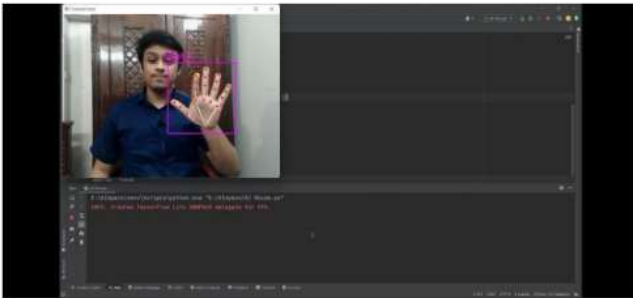
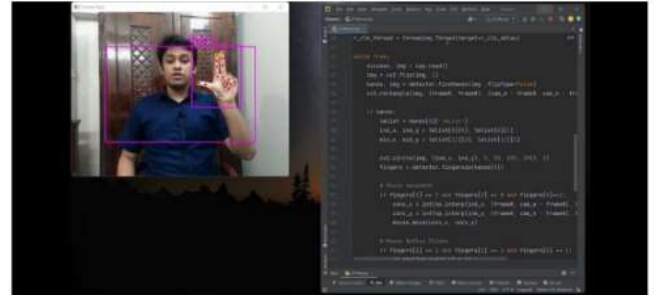

Fig 5.0.1 Architecture

6. RESULTS

Neutral Gesture :
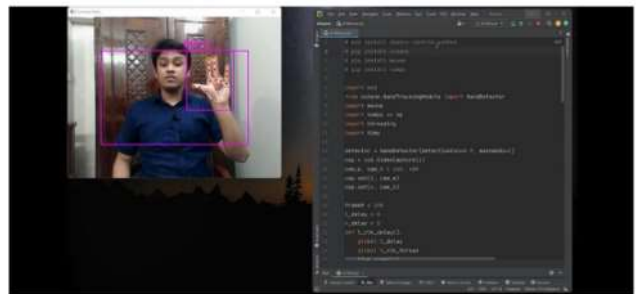
It is Used to halt/stop execution of current gesture.

Mouse Movement :

Cursor is assigned to the index finger. This gesture moves the cursor to the desired location. Speed of the cursor movement is proportional to the speed of hand.

Left Click : Gesture for single left click

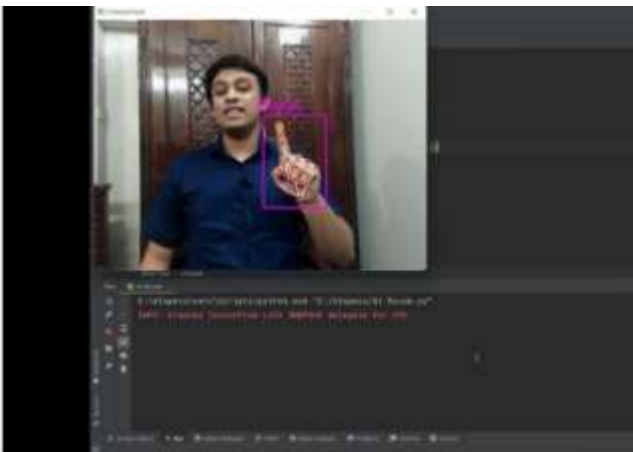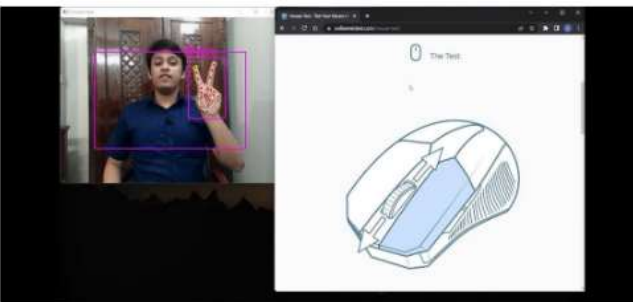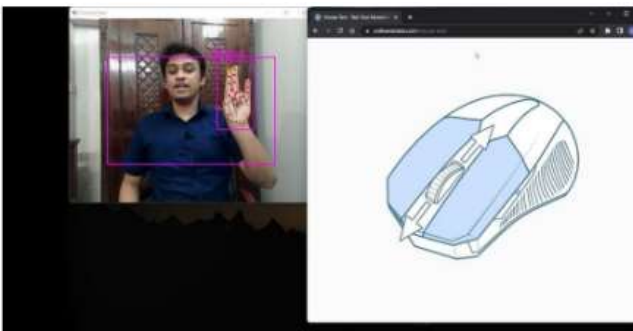**Right Click :** Gesture for single right click

Scroll down :

Dynamic Gestures for vertical scroll down. The speed of scroll is proportional to the distance moved by pinch gesture from start point.

Scroll up : Speed of the cursor movement is proportional to the speed of hand.

7. CONCLUSION

The Virtual Mouse Using Hand Gestures project is created so that the classic computer mouse can be used without an actual physical device or surface. Using a webcam to track hand gestures and then convert them into responding cursor actions. That includes the movement of the mouse cursor, the drag right clicks, left click, scroll up and down. This is a project which uses the whole new technology making the human computer interaction in an easy and friendly way with a very minimal project cost. The development of mouse movement by using certain packages like 'mouse' which will be used for the movement of mouse by using the coordinates that are linked to the detected color. This can provide ease use of systems and many other applications. So the open CV is helping the users with different accessible forms of models that will make ease life. Hence this is a

solution to the present-day input devices that are less interactive and highly tedious to work on for a large amount of time continuously. This can be used efficiently in many sectors.

8. FUTURE ENHANCEMENT

The future work will include implementation of additional gestures which can enable the user to perform more functions with ease. The proposed system during this project uses only the proper hand to perform gestures. Hence, improvement of the implemented technique in future will be possible using both hands for performing different gesture movement.

We can give more advanced virtual mouse including more facilities. Implement some extra features from time to time for enhancing the software quality. The above-mentioned points are the enhancements that can be done to increase the applicability and usage of this project. We have left all the options open so that if there is any other future requirement in the system by the user or students for the enhancement of the application then it is possible to implement them. In the last, we would like to thank all the persons involved in the development of the application directly or indirectly. We hope that the project will serve the purpose for which it is developed thereby underlining the success of the process.

9. REFERENCES

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