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Handy Mouse: Gesture Controlled Mouse

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Abstract: *The mouse is one of the wonderful inventions of Human-Computer Interaction (HCI) technology. Currently, wireless mouse or a Bluetooth mouse still uses devices and is not free of devices completely since it uses a battery for power and a dongle to connect it to the PC. In the proposed Handy mouse project, this limitation can be overcome by employing webcam or a built-in camera for capturing of hand gestures and hand tip detection using computer vision. The algorithm used in the system makes use of the machine learning algorithm. Based on the hand gestures, the computer can be controlled virtually and can perform left click, and computer cursor function without the use of the physical mouse. The algorithm is based on deep learning for detecting the hands. Hence, the proposed system will also avoid COVID-19 spread by eliminating the human intervention and dependency of devices to control the computer.*

Keywords: Mediapipe, OpenCV, Gestures, Object Detection

I. INTRODUCTION

While using developing technologies in augmented reality and devices that we use in our day-to-day life, these gadgets have grown to be compact in the form of cordless and Bluetooth technologies. This paper proposes a virtual AI mouse approach that uses hand signals and fingertip detection for undertaking mouse functions utilizing computer vision. The aim of the proposed approach is to carry out mouse cursor and scroll functions by making use of a web camera or an inbuilt camera in the pc instead of using a conventional mouse. Hand gesture and fingertip detection by using computer vision are employed as an HCI with the pc. Using AI virtual mouse method, the fingertip of the hand can be tracked by using a web camera and performing the mouse button cursor and scrolling function. We can also move the cursor with it.

While by using a Bluetooth or a wireless mouse, some devices including the mouse, the dongle to hook up with the computer, and a battery to electric power the mouse to operate are used, however, in this paper, the person uses his or her inbuilt web camera and uses his/her hand gestures to command the sensitive mouse button operations. In the proposed approach, the web camera conveys and then functions the frames that have been grabbed and then acknowledges the various hand gestures and fingertip gestures and then performs this mouse operation.

II. LITERATURE SURVEY

There are some related activities performed on virual mouse using hand gesture detection by inserting glove into the hand and using hand-painted color tips to detect gesture detection, but they are no longer very accurate in mouse functions. Also, recognition is less accurate due to wearing gloves, And gloves are also not suitable for other users, and in in some cases, the recognition is inaccurate because of failure to get coloured finger tips. Other efforts have been designed for camera-based gesture detection interface.

[1]In 1990, Quam introduced the primitive hardware-based System. In this program, the user must wear a Data Glove. The system proposed by Quam though provides results for high accuracy, but difficult to make some gesture controls using the system due to use Data Glove.

[2]Dung-Hua Liou, ChenChiung Hsieh, and David Lee in 2010 made a research proposal on "A Real-Time Hand Gesture Awareness System Using Motion History Image." the main limitation of this model is the more sophisticated hand model gestures.

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[3]Monika B. Gandhi, Sneha U. Dudhane, and Ashwini M. Patil in 2013 proposed research on "Cursor Control System Using Hand Gesture Recognition. " In this work, the the limit is kept to the required frames for processing hand segmentation and skin pixel detection.

[4]Vinay Kr. Pasi, Saurabh Singh, and Pooja Kumari in 2016 proposed "Cursor Control using Hand Gestures" . The system proposes different bands to perform different mouse functions. The limit is depending on the different colors to perform the functions of the mouse.

[5]In 2018, Abhilash SS, Lisho Thomas, Naveen Wilson, Chaitanya C proposed a paper titled as "Virtual Mouse Using Hand Gestures", which was designed to work with certain color detecting systems, different functions working on different number of colors detected. But it had its limitations, it could only perform a few mouse gestures and only worked with a static background.

[6]In MediaPipe: A Framework for Building Perception Pipelines by Camillo Lugaresi, Jiuqiang Tang, Hadon Nash, Chris McClanahan, Esha Uboweja, Michael Hays, Fan Zhang, Chuo-Ling Chang, Ming Guang Yong, Juhyun Lee, Wan-Teh Chang, Wei Hua, Manfred Georg and Matthias Grundmann in 2019 have presented MediaPipe, a framework for constructing a perception pipeline of calculators as graph. They described how the framework enables support for GPU. MediaPipe can help a developer prototype very quickly and run a perception application efficiently across multiple platforms.

[7]MediaPipe Hands: On-device Real-time Hand Tracking by Fan Zhang Valentin Bazarevsky Andrey Vakunov Andrei Tkachenka George Sung Chuo-Ling Chang Matthias Grundmann Google Research 1600 Amphitheatre Pkwy, Mountain View, CA 94043, USA 2020. In this paper, MediaPipe Hands, an hand tracking solution is obtained for multiple platforms in real time . The pipeline predicts 2.5D landmarks elimination need of any special hardware and thus, can be easily deployed to commodity devices.

[8]In 2015 M. Naveenkumar , A. Vadivel propsed "OpenCV for Computer Vision Applications"
in which a study on OpenCv has benn done and its uses in different programming languages and multiple platform.It is a slolution for computer visioin problems.

[9]Tran, DS., Ho, NH., Yang, HJ. et al.,(2021) proposed virtual mouse method using RGB-D images and fingertip detection. The required hand region and the palm are obtained using in-depth skeleton-joint information images from a Microsoft Kinect Sensor version 2. Then, the contours are found out and highlighted by a border-tracing algorithm. The Kcosine algorithm is used to detect the fingertip location, based on the hand-contour coordinates. At last, to control the mouse cursor fingertip coordinates are mapped to RBG images. Limitations are faced in this study due to the use of Kinect Sensor.

We have used the above paper as our base paper. Above study used Kinect sensor for fingertip detection. We have studied the same and implemented it using integrated webcam with the help of mediapipe library, OpenCV and linked it to mouse controls using autopy.

III. PROPOSED SYSTEM

The proposed Handy mouse system works extremely well to overcome complications in the real-world including conditions where there can be no space to use a physical mouse button as well as for the particular people who may have difficulties in their palms and are not necessarily able to manage a physical computer mouse. Also, amidst the COVID-19 situation, it is risky to use the particular device by physically contacting them, because this may possibly result in the spreading of the virus by pressing the devices, and so the proposed mouse can be taken to overcome these types of problems since palm gestures and fingertip detection can be used to control the particular PC mouse features by utilizing a webcam.
In the suggested Handy mouse system, the model utilizes the MediaPipe package for the tracking of the fingertips and hands, and also, Autopy, Pynput and PyAutoGUI packages were used for moving around the window display screen of the pc for performing functions such as cursor movement and clicking functions. The results of the proposed model showed a high

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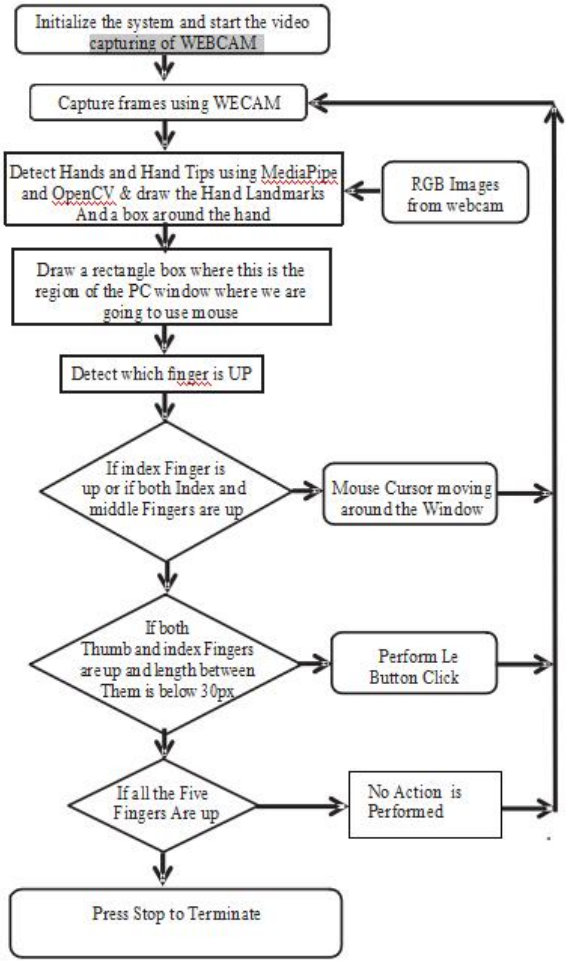
accuracy level, and the proposed model can function very well in the real-world programs using CPU and without using GPU.

The following is a working model of the system.



IV. Conclusion

The main purpose of the virtual AI mouse system is to control mouse cursor functions by using a gesture instead of using a portable mouse. The proposed system can be accessed using a webcam or a built-in camera detects the gestures of a hand and a tip of a hand and processes these images to perform specific mouse functions. Our approach is to use the mediapipe library and its hand recognition attributes to link them with mouse operations using autopy. Object detection model and non-maximum suppression are the algorithms used in mediapipe library.

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