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A REVIEW ON IMPLEMTATION OF VISION GLIDE TECHNIQUE FOR SMOOTH NAVIGATION WITH CAMERA BASED VIRTUAL MOUSE

Prof.S.S. Ganorkar[1]
Project Guide Dept.IT
KDKCE,Nagpur,India
s_ganorkar@kdkce.edu.in

Anagha D. Tembhurne[2]
Dept. Information Technology
KDKCE,Nagpur,India
anaghatembhurne516@gmail.com

Anjali P. Badole[3]
Dept.Information echnology
KDKCE,Nagpur,India
anjalibadole851@gmail.com

Dipti D. Dhore[4]
Dept. Information Technology
KDKCE,Nagpur,India
diptidhore14@gmail.com

Jayesh M. Tawade[5]
Dept.Information echnology
KDKCE,Nagpur,India
jayeshtawade3@gmail.com

Prajwal N. Neral[6]
Dept. Information Technology
KDKCE,Nagpur,India
prajwalnm11@gmail.com

Vitthal D Ghanwate[7]
Dept.Information Technology
KDKCE,Nagpur,India
vitthalghnwate24@gmail.com

ABSTRACT- As artificial intelligence technology has advanced, it has become commonplace to employ hand gesture detection to control virtual objects. The suggested system in this research is a hand gesture-controlled virtual mouse that uses AI algorithms to recognize hand gestures and transform them into mouse movements. People who have trouble using a conventional mouse or keyboard can use the system to provide an alternate interface. The suggested method takes pictures of the user's hand with a camera, which an AI program then utilizes to identify the motions the user is making. Since the development of computer technology, the method for constructing a process of human-computer interaction is advancing. The mouse is one of the best pieces of HCI (Human-Computer Interaction) technology ever created.

This article suggests an HCI-based virtual mouse system that makes use of hand movements and computer vision. webcam or built-in camera recordings of gestures that have been subjected to a color segmentation and detection procedure. This system uses a webcam or an integrated camera to capture frames. It then processes the frames to make them trackable, identifies various user motions, and executes mouse functions. In order to make the interaction more effective and dependable, this study suggests a vision-based system to control various mouse behaviors, such as left and right clicking, using hand gestures. This system uses a webcam or an integrated camera to capture frames. It then processes the frames to make them trackable, identifies various user motions, and executes mouse functions. Therefore, the suggested mouse solution removes the need for a device to use a mouse. Therefore, it can be seen that the development of HCI technology is advantageous.

Keywords- HCI (Human Computer Interaction), Hand Gesture, Gesture Recognition, OpenCV, Media-pipe, pyAutoGUI.

I. INTRODUCTION

There are many aspects of daily living that are influenced by technology. There are so many technologies available now, and computer technologies are advancing concurrently over the globe.. In an interactive setting, gestures are one of the most crucial forms of computer communication. There are so many technologies available now, and computer technologies are advancing concurrently over the globe. They are used to carry out a variety of duties that people are incapable of carrying out.

With the help of a webcam or built-in camera and a colored hat or piece of colored sticky note paper, it is quite easy to capture and track the fingertip of a hand using this gesture recognition system. The system will then monitor the color and movement of the hand and move the cursor along with it. In this research, a vision-based method for detecting hand motions and carrying out various mouse-like actions, like left and right clicking, is provided. Folding the first and middle fingers of the hand creates the baby-like mouse clicks on the left and right, respectively.

The AI virtual mouse framework is powered by the Python programming language. In addition, Open CV, a library for mobile PC vision, is used at various points in the AI virtual mouse framework. Many developers have made a variety of attempts to create models that can recognize human gestures. Artificial intelligence is one of the many developing technologies that is having a significant impact on every industry. Artificial intelligence makes life for humans easy and quick.

We are using the most recent artificial intelligence algorithms and tools to address the issues with the current methodologies. Artificial intelligence-based hand gesture control of a virtual mouse enables users to operate their computer mouse using hand motions without the usage of a real mouse. This technology tracks the user's hand motions and uses a camera vision-based method to carry out mouse functions on the computer screen. The centroid is also moved

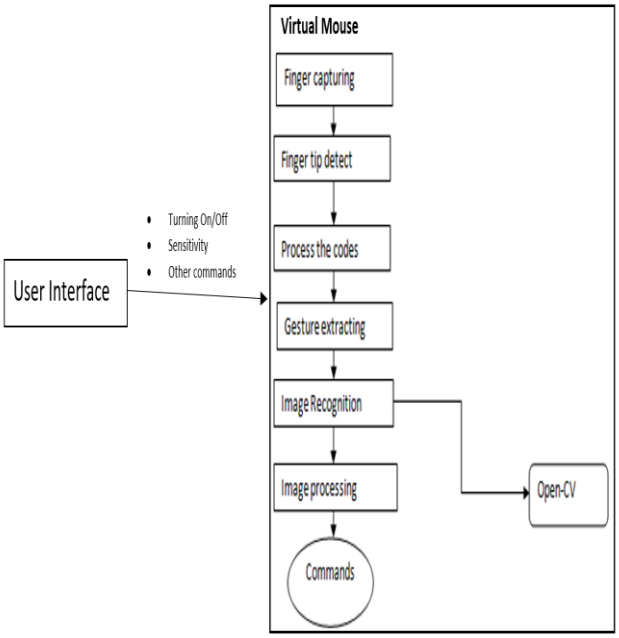
by hand motion, making this the fundamental sensor for changing the cursor on a computer screen.

II.PROBLEM DISCRIPTION & OVERVIEW

To track fingertips as a movable object, and to utilize it for mouse functions, the camera should be positioned in a way so that it can see the user's hands in the right positions. This can be used in space-saving situations, for those patients who don't have control over their limbs and for other similar cases. It's a virtual mouse instead of a physical mouse which will work only based on webcam captured frames & tracking colored fingertips.

III. SIGNIFICANCE IN REAL WORLD APPLICATION

Video conferencing is very popular nowadays. For this reason, most of the computer users use a webcam on their computer and most of the laptops have a built-in webcam. The proposed system which is webcam based, might be able to eliminate the need of a mouse partially. The process of interaction with a computer using hand gesture is a very interesting & effective approach to HCI (Human-Computer Interaction). There is some really good research on this interest. The hand gesture recognition technology is also popular in sign language recognition.



IV. OBJECTIVE

The goal is to create and put into use a different mouse cursor control system. An alternate approach uses a webcam and a color-detection technique to recognize hand gestures. The ultimate goal of this work is to create a system that uses any computer's color detection technology to detect hand gestures and control the mouse cursor.

V. HAND GESTURE TECHNOLOGIES

Gestures are most considered as the most natural and expensive way of communications between computer and human in virtual environment and it is the only a powerful way of communication among humans. The major constraint is interfacing of gesture movement with the computer. For initialing the system, first step is to collect the gesture data in order to accomplish the specific application. For gesture recognition system and hand posture different technologies are discovered for acquiring the input data.

Vision based approaches: Recognition system only requires the camera to capture the image for natural interaction between human and computers. That is more useful in real time applications [23]. Although this technique is simple but there are lots of challenges while implementing such as complex background, lighting conditions and variations, and other skin color objects with the hand object. Vision based technology deals with the characteristics of image such as texture and color that are required for the identification of gesture. There are many techniques evolved for detecting hand object after the image pre-processed image, these methods are divided into two parts.

1) *MediaPipe*

Google created the open-source MediaPipe framework to enable the development of cross-platform, real-time

computer vision applications. For processing and analyzing video and audio streams, it offers a number of pre-made

tools and components, such as object detection, pose estimation, hand tracking, facial recognition, and more.

Developers can quickly construct intricate pipelines using MediaPipe that combine numerous algorithms and processes and execute in real-time on a variety of h/w platforms, like CPUs, GPUs, and specialized accelerators like

Google's Edge TPU. Additionally, the framework has interfaces helps us interacting with other well-liked machine learning libraries, including TensorFlow and PyTorch, and it supports several programming languages, like C++,

Python, and Java.

For computer vision and ML tasks, MediaPipe is a comprehensive library that offers a many of features. Here are a

few of the library's main attributes and features:

1. Video and Audio Processing: MediaPipe provides tools for processing and analyzing video and audio

streams in real-time. This includes functionalities such as video decoding, filtering, segmentation, and

synchronization.

2. Facial Recognition: MediaPipe can detect and track facial landmarks, including eyes, nose, mouth, and

eyebrows, in real-time. This functionality is useful for applications such as facial recognition, emotion

detection, and augmented reality.

3. Hand Tracking: MediaPipe can track hand movements in real-time, allowing for hand gesture recognition

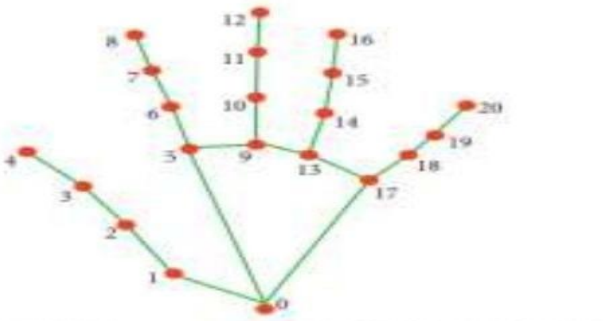
and interaction with virtual objects.

4. Object Detection: MediaPipe can detect and track objects in real-time using machine learning models. This

functionality is useful for applications such as augmented reality, robotics, and surveillance.

5. Pose Estimation: MediaPipe can estimate the poses of human bodies in real-time, allowing for applications

such as fitness tracking, sports analysis, and augmented reality.



2) *Open CV*

A computer vision and ML software library called OpenCV is available for free download. Its objective is to aid

programmers in the development of computer vision applications. Filtering, feature identification, object

recognition, tracking, and other processing operations for images and videos are all available through OpenCV.

Python, Java, and MATLAB are just a few of the numerous programming languages that it has bindings for. It is

written in C++.Robotics, self-driving cars, AR, medical image analysis, and other fields are just a few of the fields

where OpenCV can be employed. A wide range of algorithms and tools are included in the library, making it simple

for programmers to build sophisticated computer vision applications.

The steps listed below can be used to broadly classify OpenCV's operation:

1. Loading and Preprocessing the Image/Video: OpenCV can load images or videos from a variety of sources

such as files, cameras, or network streams. Once the image or video is loaded, it can be preprocessed by

applying filters or transforming the image to a different color space, such as converting a color image to

grayscale.

2. Feature Detection and Description: OpenCV can detect and extract features from an image or video, such

as edges, corners, and blobs. These features can be used to identify objects or track their motion over time.

OpenCV also provides algorithms for describing these features, which can be used to match them across

multiple frames or images.

3. Object Detection and Recognition: OpenCV can be used to detect and recognize objects in an image or

video. This can be done using a variety of techniques, such as template matching, Haar cascades, or deep

learning-based methods.

4. Tracking: OpenCV can track objects in a video stream by estimating their position and motion over time.

This can be done using a variety of algorithms, such as optical flow, mean-shift, or Kalman filtering.

5. Image and Video Output: Finally, OpenCV can be used to display or save the processed images or videos.

This can be done by showing the images in a window, writing the video frames to a file, or streaming the

video over a network.

In general, OpenCV offers a large variety of tools and techniques for working with image and video data, making it

a potent library for computer vision applications.

3) TKinter

Tkinter is a standard graphical user interface (GUI) library for Python that allows you to create windows, dialogs, buttons, labels, and other GUI elements for desktop applications. It is included with most Python installations, making it a convenient choice for developing cross-platform applications with a graphical interface. Tkinter is based on the Tk GUI toolkit, which originated as part of the Tcl scripting language.

Here are some key concepts and components of Tkinter:

Widgets: Tkinter provides a variety of GUI widgets (controls) that you can use to build your applications, such as labels, buttons, text entry fields, checkbuttons, radio buttons, and more.

Geometry Managers: Tkinter supports several geometry managers to help you arrange and control the placement of widgets within your application window. The most commonly used managers are pack, grid, and place.

Event Handling: You can bind functions to events that occur in your application, such as button clicks, keyboard input, and mouse actions. Tkinter provides mechanisms to handle these events.

Top-level Windows: You can create top-level windows for your application using the Tk() constructor. Each top-level window can have its own set of widgets and event handling.
Tkinter is a versatile library, and you can use it to build a wide range of desktop applications, from small utilities to more complex software. You can extend its functionality with third-party libraries, and there are many tutorials and documentation resources available to help you get started with Tkinter GUI development in Python.

VI. CONCLUSION

The conclusion of this model can be reached by using computer vision techniques like open CV, color variation approaches, and the generation of mouse movement through the use of specific packages. This can simplify the use of systems and many other applications.
Remote gesture controls the mouse is a sophisticated technology that uses a real-time camera to direct the mouse cursor and carry out its duty. We put mouse navigation, icon selection, and actions like left, right, double clicks, and scrolling into practice. To perform mouse indicator motions and icon selection, this system relies on picture comparison and motion detection technology. After analysing the data, it is possible to predict that the algorithms will operate in any domain if we supply adequate lighting and a good camera. Afterward, our system will be more organized. We intend to combine more functionalities in the future, like interaction across various.

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