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PYTHON MINI-PROJECT

VIRTUAL MOUSE

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VIRTUAL MOUSE

Abstract:

The Python Mini Project aims to create a Virtual Mouse using computer vision and gesture recognition techniques. The project utilizes the OpenCV library to detect hand gestures and control the mouse pointer on the screen. By tracking the movements of the user's hand, the Virtual Mouse provides an alternative and intuitive way to interact with a computer without the need for physical mouse devices.

Introduction:

Traditional computer input devices such as keyboards and mouse have been the primary means of interacting with computers. However, there is a growing interest in exploring alternative input methods that can enhance user experience and accessibility. The Virtual Mouse project leverages computer vision and gesture recognition techniques to create a hands-free, gesture-based interface for controlling the mouse pointer on the screen.

The project utilizes the OpenCV library, which provides a wide range of computer vision functions and algorithms, including hand detection and tracking. By leveraging OpenCV, the project can detect and track the user's hand in real-time from a webcam feed. The position and movements of the hand are then translated into corresponding mouse movements and actions on the screen.

Methodology

To create the Virtual Mouse, the project involves several key steps. First, the hand is detected and segmented from the webcam feed using OpenCV's hand detection algorithms. Next, the project tracks the hand movements and maps them to corresponding mouse movements using predefined rules or algorithms. The project also includes gesture recognition capabilities to enable actions such as left-click, right-click, and scrolling.

Libraries

OpenCV (Open Source Computer Vision Library) provides a wide range of computer vision algorithms and tools. We will leverage its capabilities to detect and track the user's hand or face in real-time video input.

Mediapipe, developed by Google, offers a robust framework for building various perception applications. We will utilize its hand tracking or face detection functionality to extract key landmarks from the video feed.

PyAutoGUI is a cross-platform GUI automation library that allows us to programmatically control the mouse and keyboard. By integrating it into our project, we can translate the hand or facial movements detected by OpenCV and Mediapipe into corresponding mouse movements.

Advantages

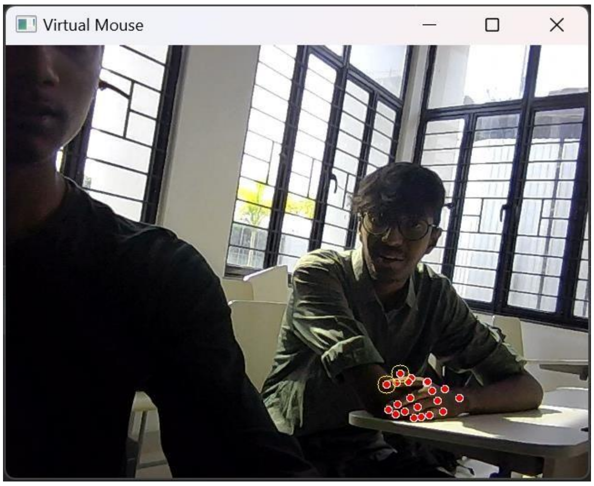
The Virtual Mouse project offers several advantages. It provides an intuitive and natural way of interacting with a computer, eliminating the need for physical mouse devices. This can be particularly beneficial for individuals with physical disabilities or mobility limitations. Additionally, the Virtual Mouse can be used in scenarios where using a physical mouse is impractical or inconvenient, such as in presentations or interactive exhibits.

Code

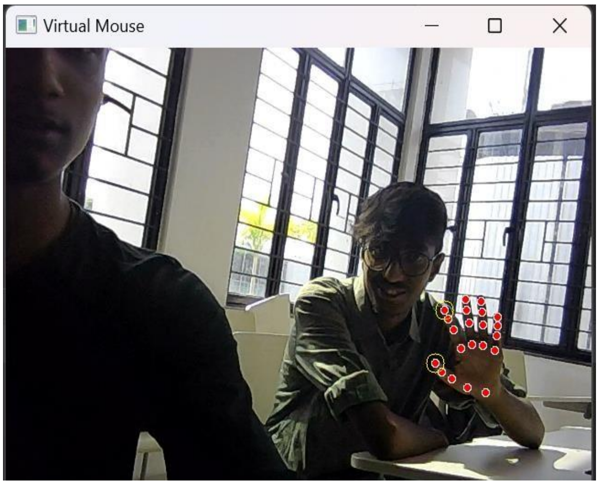
```
import
cv2
         import mediapipe as mp
         import pyautogui
         cap = cv2.VideoCapture(0)
         hand_detector = mp.solutions.hands.Hands()
         drawing_utils = mp.solutions.drawing_utils
         screen_width, screen_height = pyautogui.size()
         index_y = 0
         while True:
             _, frame = cap.read()
             frame = cv2.flip(frame, 1)
             frame_height, frame_width, _ = frame.shape
             rgb_frame = cv2.cvtColor(frame, cv2.COLOR_BGR2RGB)
             output = hand_detector.process(rgb_frame)
             hands = output.multi_hand_landmarks
             if hands:
                 for hand in hands:
                     drawing_utils.draw_landmarks(frame, hand)
                     landmarks = hand.landmark
                     for id, landmark in enumerate(landmarks):
                         x = int(landmark.x*frame_width)
                         y = int(landmark.y*frame_height)
                         if id == 8:
                             cv2.circle(img=frame, center=(x,y), radius=10, color=(0,
         255, 255))
                             index_x = screen_width/frame_width*x
                             index_y = screen_height/frame_height*y

                         if id == 4:
                             cv2.circle(img=frame, center=(x,y), radius=10, color=(0,
         255, 255))
                             thumb_x = screen_width/frame_width*x
                             thumb_y = screen_height/frame_height*y
                             print('outside', abs(index_y - thumb_y))
                             if abs(index_y - thumb_y) < 20:
                                 pyautogui.click()
                                 pyautogui.sleep(1)
                             elif abs(index_y - thumb_y) < 100:
                                 pyautogui.moveTo(index_x, index_y)
             cv2.imshow('Virtual Mouse', frame)
             cv2.waitKey(1)
```

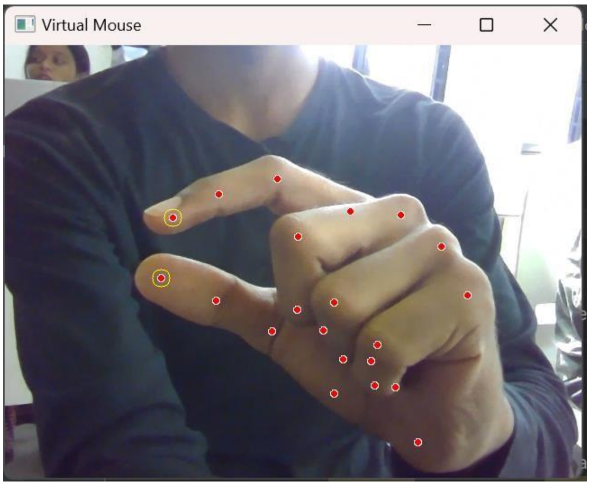
Output



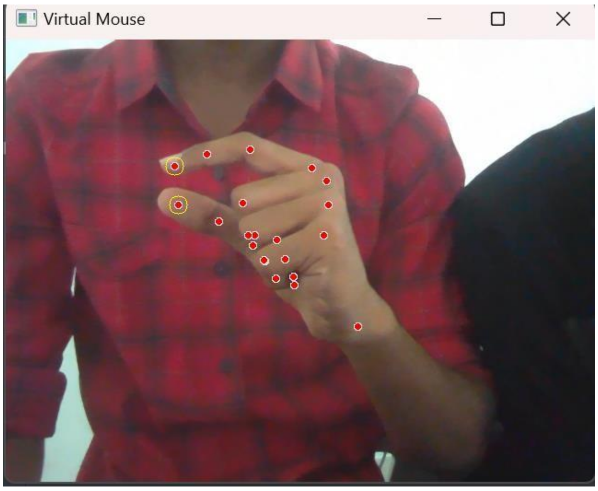
Hand Detection



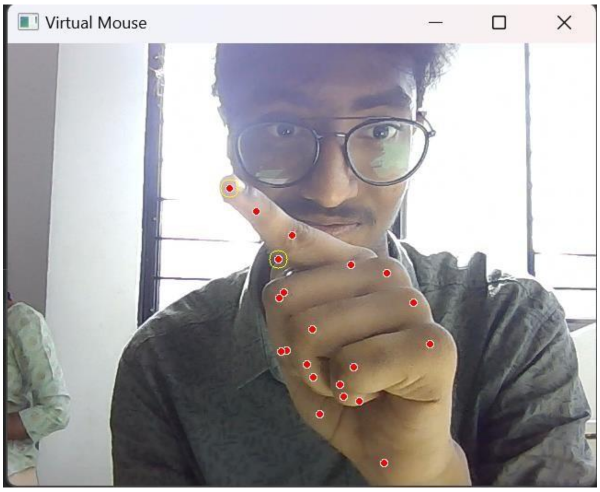
Hand landmarking



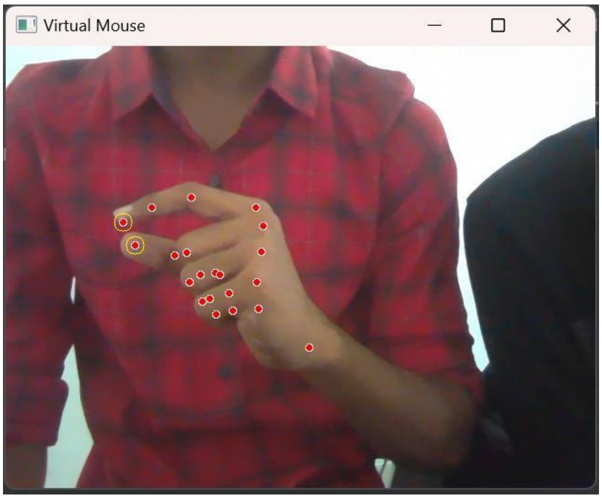
Index and thumb recognition



Index and thumb marking



Cursor movement operation



Clicking operation

References

https://chat.openai.com/

https://youtu.be/vJWzH_2F64g

https://github.com/ProgrammingHero1/virtual_mouse

Conclusion:

The Virtual Mouse project successfully demonstrates the feasibility of creating a gesture-based mouse control system using computer vision techniques. By leveraging the OpenCV library and hand tracking algorithms, the project provides a hands-free and intuitive way to interact with a computer. The Virtual Mouse offers potential applications in various domains, including accessibility, gaming, and interactive displays.

While the project provides a functional Virtual Mouse prototype, there are opportunities for further enhancements and refinements. Improvements can be made to optimize the hand detection and tracking algorithms to increase accuracy and responsiveness. Additionally, the project can be extended to support additional gestures and actions to provide a more comprehensive and versatile interaction experience.

Overall, the Virtual Mouse project showcases the power of computer vision and gesture recognition in revolutionizing human-computer interaction. By enabling hands-free control of the mouse pointer, it opens up new possibilities for accessibility and user experience in the digital world..