AIR CANVAS APPLICATION

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Abstract - *Writing in Air is a Fascinating thing. This can be achieved by Computer Vision Techniques . Air Canvas is a novel way of painting virtually without using a physical brush or canvas. It is made of system that can catch movements of artists and can draw even without touching keyboard, mouse, or touchpad. Here fingertip detection and tracking using MediaPipe are used to achieve the objective. The colour marker is detected on index finger and Object tracking is considered an important task within the field of Computer Vision. Hand Tracking and Shapes Drawing is done using Computer Vision frameworks in python.*

Key Words: OpenCV, MediaPipe, Hand Tracking, Computer Vision (CV), Shapes Integration.

1.INTRODUCTION

Based on idea of drawing in air the "AIR CANVAS"is made. The Aircanvas works using function of movements tracking where user must do movements in front of the input devices as like camera. Users may write, draw, and communicate without using actual surfaces by using a computer vision technique called "air writing," which tracks and interprets hand or tool movements in the air. These gestures can be captured and recognized, enabling applications for sign language recognition, virtual reality, and augmented reality engagement. The key requirements of air canvas are only that the user must be on distance where it can be clearly visible to camera so that camera can take proper input. It is very well carried out by using python libraries named as OpenCV and MediaPipe which has ready to used ML solutions for recognition and tracking. We are using hand gesture recognition with the use of machine learning algorithm by using python programming, which creates natural interaction between man & machine.
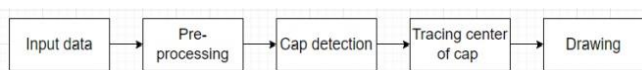
2.EXISTING SYSTEM

Fig : Block Diagram of Existing System

Traditional Art refers to the fine art which is made before the digital Art. The Traditional way incorporates pen and paper, chalk also, board for writing.

Once the digital artwork got picked up ,the usage of computer vision techniques had become popular . In the existing system , OpenCV plays a main role in object recognition i.e., a cap . The user can select any colour and draw or write .But it become complex when they try to draw any shape and even the object tracking is so inaccurate to detect by the webcam .

Some of the major disadvantages includes :
(1)Complex to detect the cap / object movement.
(2)Inaccurate Results as the Object tracking is complex.
(3)Used for only Writing Purposes.
(4)User feel difficult to draw the shapes.
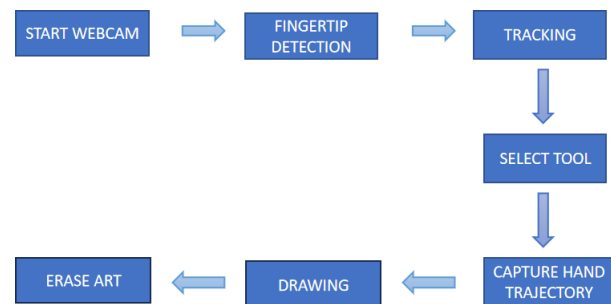
3.PROPOSED SYSTEM

Fig : Block Diagram of Proposed System

The project starts by initializing the video interface through webcam. The system uses OpenCV which is open-source computer vision library to process the video. We are using cv2.VideoCapture() function to get a video capture object for the camera and will read the data from that object using VirtualAirCanvas.cap.read() for further processing.
VirtualAirCanvas.cap = cv2.VideoCapture(0)
Once the video has been processed, system uses MediaPipe to detect and identify landmarks on the user's hand. Using the process () function, the system can detect the hand landmarks.


We can draw or write on the canvas or screen when the "draw" tool is selected with the index finger. Together with this, "Shapes Integration," or the ability to use pre-made shapes on the canvas by just selecting the desired shape, is another key component of the suggested approach. We provided a variety of forms, including rectangles, lines, and circles. Moreover, we can remove the artwork by simply choosing the erase tool. The user can exit the application by pressing 'esc' key .

4.OBJECTIVES

(1) Fingertip tracking rather than using any object.
(2)MediaPipe is used for positioning of fingers.
(3)Inbuilt Shapes can be easily selected.
(4)Able to clear the window virtually.
(5)No need to touch the screen.
(6)No Object(cap) is required.

5.METHODOLOGY

The total process of the system is explained in simple sequence diagram as shown :
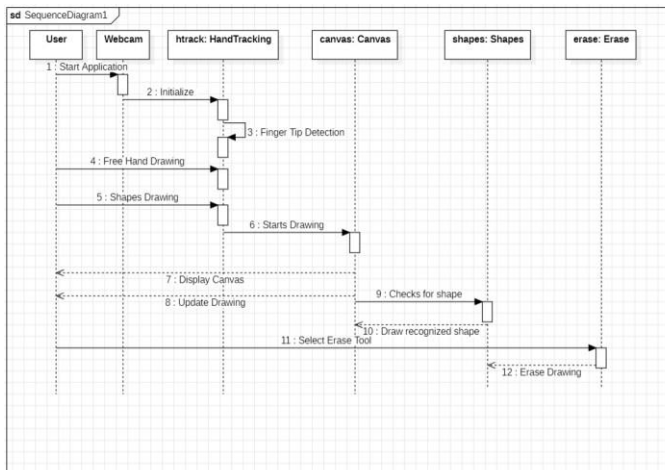
The methodology implemented in the system is divided into four modules as follows :

1. Finger Tip Recognition

2. Writing with free hand

3. Shapes Integration

4. Erase Virtually

By implementing these four modules step by step   The Air Canvas Application is developed. In this proposed framework, we are going to utilize camera and the screen for the reading inputs and displaying outputs. We are using our hand fingers to drawing required shapes on the output screen. Hence it is reading our input by recognizing accurate movements of our fingers tip. Some other hand sign for selecting shapes and draw going to use as per given in used modules and libraries.

5.1. FINGER TIP RECOGNITION

This module focuses on accurately detecting and interpreting user hand gestures and track specific points on the hand, such as fingertips, palm, and joints. Utilizes computer vision libraries such as OpenCV and MediaPipe for real-time hand tracking and gesture recognition.

5.2. WRITING WITH FREE HAND
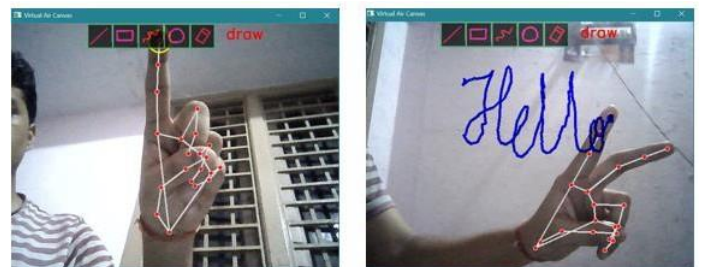
This module enables users to draw or write with free hand in air in front of the webcam using natural hand gestures. Employs MEDIAPIPE for solving the issues in hand tracking. When the user points the index finger on to the draw tool , the user can start drawing or writhing base on his requirement. The appropriate tool name is been specified on the screen when he points on the tool.
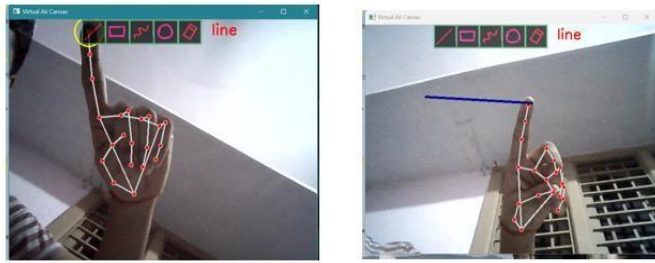
5.3. SHAPES INTEGRATION

Fig : LINE SELECTION & DRAWING

Once the user points on the shape tool using index finger, the specified tool is selected. Now he needs to raise the middle finger to draw the shape. Once he is done with drawing , he can close the middle finger. Then the specific shape is displayed on the screen.
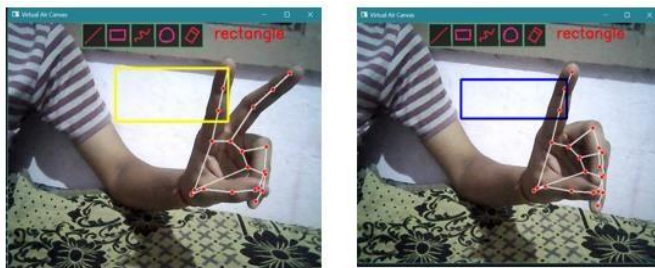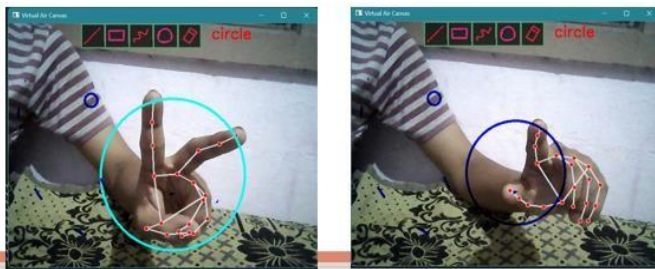

Fig : RECTANGLE DRAWING

Fig : CIRCLE DRAWING

Similarly, all the required can be easily drawn just by pointing the index finger of the user on specified shape tool.
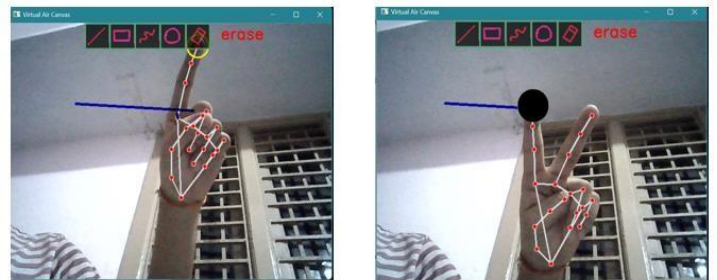
5.4. ERASE VIRTUALLY

Fig : ERASE TOOL SELECTION

Air Canvas application enables users to switch to the erasing mode by using the selection mode from the toolbar and clicking on the eraser icon. It draws a transparent line when the finger moves thus erasing colored points. By processing the video frames and selectively removing corresponding drawings from the canvas, the application creates the effect of erasing unwanted strokes.

6. OUTPUT SNAPSHOTS
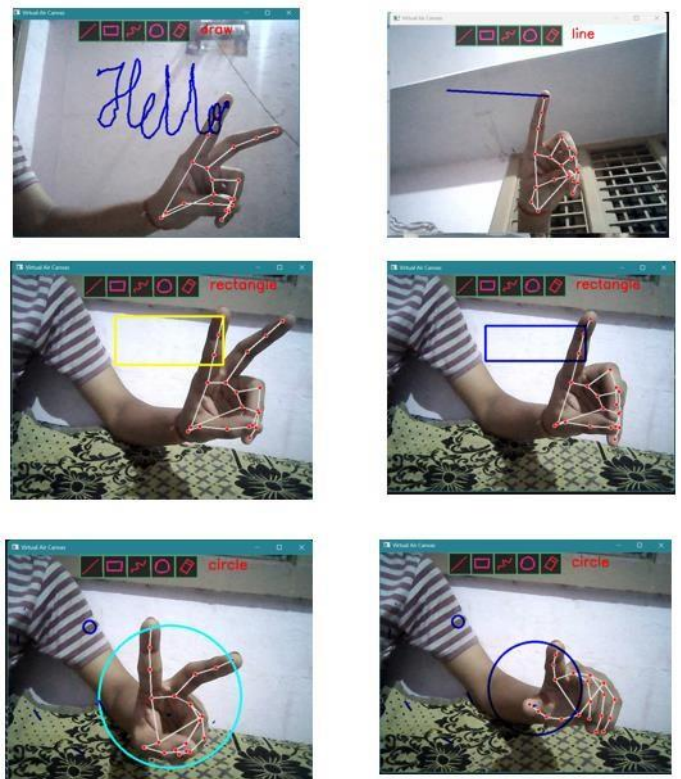
7. CONCLUSION

The system significantly contributes to the field of interactive learning and computer vision-based writing applications. By integrating existing approaches and introducing novel features, our solution offers a robust and versatile virtual canvas platform. Through the usage of MediaPipe and OpenCV, we have improved user experience and interaction.

The field of Human-Computer Interaction has witnessed a remarkable transformation with the development and implementation of the Gesture-based HCI system presented in this project. This innovative system enables users to interact with digital interfaces through intuitive hand gestures, providing a level of versatility and naturalness that traditional input devices struggle to match. Our project has addressed the limitations of conventional drawing tools, offering a seamless and efficient solution for users to perform a wide range of tasks, from precise writing to shapes Drawing just by hand gestures. The successful integration with shapes, providing users with the ability to create various shapes using their hands, represents a significant leap in HCI innovation.

8. FUTURE ENHANCEMENT

The scope of this project is:

It will produce an effective communication between peoples that will reduce the uses of laptops and mobile phones by abolishing the writing need. The major scope is in the teaching field while teaching online or teaching on screen. Without the mouse or any markers, we can easily implement on the screen. It will use in the designing purposes to create the immersive or interactive designs.

(1) **Gesture & Shapes Vocabulary**: Enhance the system by adding more gestures and shapes to increase its functionality. Recognize a broader range of gestures for increased user convenience.

(2) **Multimodal Integration**: Explore the integration of voice commands to create a multi modal HCI system. This allows users to combine hand gestures with voice instructions for a richer interaction experience.

(3) **Cross-Platform Compatibility**: Extend compatibility to various operating systems and applications, making the system adaptable to different user needs.

(4) **User Customization**: Develop features that enable users to customize gesture definitions, making the system more personalized and versatile.

9. REFERENCES

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