PROJECT PAPER:

Muhammad Hamza Rao

Title: Gesture-Controlled Real-Time Virtual Drawing Software

Description: This project introduces a novel approach to real-time virtual drawing using hand-gesture control. The script works on libraries such as MediaPipe and OpenCV to accurately sense and recognize hand movements. Users can utilize intuitive gestures, primarily using their index finger to draw and erase, and a combination of index and middle fingers to hover and make selections. This innovative software offers a professional-grade solution for interactive virtual drawing experiences.

Key Features:

- Hand Gesture Recognition: The software accurately recognizes a variety of hand gestures, including pointing with the index finger to draw, erasing with the same finger, and hovering over virtual elements using a combination of the index and middle fingers.
- Real-Time Rendering: Virtual drawings are rendered on the screen in real-time, providing users with immediate visual feedback as they create artwork.
- Intuitive Controls: The system offers intuitive controls that mimic natural drawing movements, enhancing the user experience and enabling fluid interaction with the virtual environment.
- Customization Options: Users can customize various aspects of the virtual drawing experience, such as color paletteand eraser settings, to suit their preferences and creative style.

Applications:

- Digital Art Creation: Artists and designers can use the software to create digital artwork with precision and fluidity, leveraging natural hand gestures for an immersive drawing experience.
- Education and Training: The software can be utilized in educational settings to teach drawing and painting techniques, offering students a hands-on approach to learning.
- Interactive Presentations: Presenters and educators can use the software to create engaging and interactive presentations, allowing them to draw diagrams and illustrations in real-time during lectures or demonstrations.

Module Used:

1. **OpenCv (cv2):-** OpenCV is an open-source library for computer vision and machine learning tasks, offering a wide range of tools for image and video processing.
2. **Numpy:-** A fundamental package for scientific computing in Python, providing powerful tools for working with multi-dimensional arrays and matrices, along with a collection of mathematical functions to operate on these arrays efficiently.
3. **MediaPipe:-** An open-source framework by Google that provides cross-platform tools for building scalable, real-time perception pipelines for various tasks, including hand tracking, gesture recognition, and augmented reality applications.
4. **HandTrackingModule:-** Self-made module specific for this task contains methods:-
    - findHands: To find and track hand(s) in real-time video.
    - findPositions: To locate and calculate the position and dimensions of all points of fingers.
    - fingersUp: To calculate the number of fingers separated from the fist.

+49 176 8911 9122
rmuhammadhamza86@gmail.com
www.linkedin.com/in/Muhammad-Hamza-Rao
https://github.com/M-Hamza-Rao