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Aircanvas Using Opencv

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Abstract: Virtual reality has been one of the most fascinating and trending topics in the areas of artificial intelligence and machine learning. Aircanvas has been one of the best ways to interact with the software and increase the communication between the operating system and the user. This reduces the manual work in operating the computer and prevents the dependency of educational institutions on expensive hardware. This project is based on Human Computer Interaction. This project consists of three modules: firstly, the aircanvas module, airvolume module and aircursor module which collectively controls all the functionalities of a computer just by using hand gestures. The project involves recognition of fingertips and projectory tracking to record the direction in which the hand moves.

Index Terms **– Aircanvas, Fingertip, OpenCV, Hand Gestures, recognition, etc.**

I. INTRODUCTION

The term AIRCANVAS is self-explanatory. The idea of Aircanvas is basically writing virtually without any physical contact. This whole project is designed using python which is a very powerful language which supports many different libraries and packages. Packages used in this project are NumPy, pandas and OpenCV. Aircanvas is especially recommended for people who are disabled and cannot use the software like a normal person would do. The major advantage of this project is that it reduces the dependency on expensive hardware by schools and colleges mainly. It might be a simple project but it solves a very big problem faced by financially weaker educational institutions. Python is one of the most advanced general programming languages. The object-oriented approach often helps programmers write understandable logical codes for small and large-scale projects. The main purpose of digital crawing is to create a system that will support digital drawing.

II. PROBLEM STATEMENT

Reducing the dependency on expensive hardware and making teaching process efficient and advanced using OpenCV.

III. SCOPE

Given more time to complete this project, we will improve hand contour recognition, explore our original aircanvas goals, and try to understand more core modules. We will look into OpenCV to improve mmmotion tracking. There are many different methods for contour analysis, but in this particular algorithm it may be worth looking at the color histogram used to create the relevant contours. We can also try different interpolation methods. Pygame includes a line drawing method that can be used to create better, cleaner lines. Similarly, using a variety of brush shapes, textures, and even an eraser will make the aircavas module more functional. A way to connect air canvas to a real digital painting program like Adobe Photoshop can be provided to save the projects.

Given more time and more expert assistance we can take the project to a new stage. By accompanying the proposed model with a visual motion sensing camera we can operate the Aircanvas from a greater distance and hand gesture detection can be made flexible and more efficient. Moreover, this project aims to bring a decrease in the price of education hardware cost by a huge margin. Further this project can be used in architecture renderings and medical practices where the similar operations can be done in 3-D format where multiple sensors and cameras can be used to make this possible.

IV. METHODOLOGY

Writing is air is some of the best and most complex research in image processing and pattern recognition in recent years and has contributed immensely to the advancement of automated processes. It can improve the interaction between humans and machines in many applications. Some studies have focused on new technologies and methods that would reduce the manual work and will provide a greater reliability. Object tracking is considered an important task in the functioning of a computer vision. The project is divided into three concepts, aircanvas, airvolume and aircursor. This is the ability to draw in the air, change volume and control cursor without the physical contact. Recognition of the image is done with the help of opencv package. Fingertips are tracked and trajectory is recorded. The captured image is transformed into several frames and analyzed. If no hand is detected then the whole process gets terminated and no output is produced. Therefore, the hand acts as an input. The whole process in given in the diagram below:

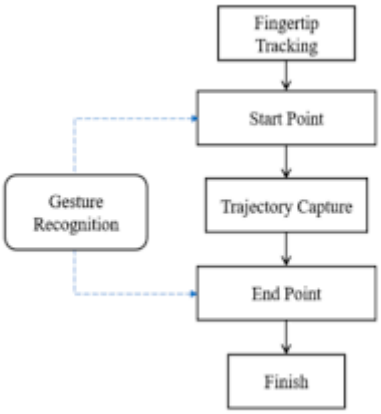

Figure 1: Aircanvas Flowchart

The UI of this application is made using tkinter which is a python package used to make graphical output elements for python applications. Simple to use and understand buttons are displayed on the screen which make it easier to run all the functionalities of the application. Taking more and more reviews about the usage of the application would result in the betterment of the output and scalability of the project across the market. Hand Tracking Hand tracking is the process in which opencv detects the hand from the input feed and uses it for further progress. It majorly focusses on hand's movement and orientation. Hand tracking allows us to create multiple projects and applications based upon opencv and python by taking orientation and hand recognition as input. This hand tracking code is fairly usable as this code can be converted into a module and this module can be imported into various applications. One code but different applications and with rise in applications there will be rise in scalability of the project. There are two stages for the hand to be tracked:

1. Palm Detection: Mediapipe works on the complete input image and provides a cropped image of the hand.
2. Hand landmarks identification: Mediapipe finds the 21 hand landmarks on the cropped image of the hand.

The 21 hand points that Mediapipe identifies are shown in the image below.

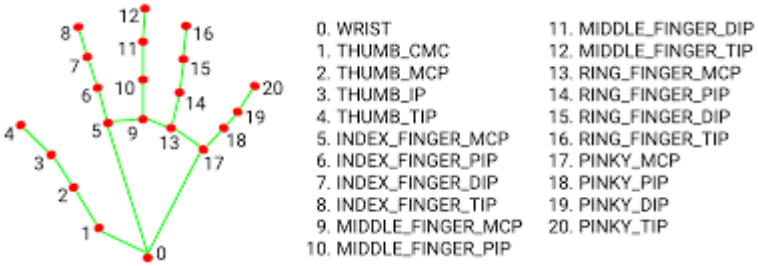

Figure 2: Mediapipe hand-tracking co-ordinates

4.1 Code Requirements

This project is written in Python and uses python libraries like Numpy, Mediapipe, OpenCV, Tkinter and Pandas. The complexity of the code is not high, but its applications are limitless. OpenCV is a computer vision software packagfe responsible for detecting and capturing the image from the camera. It also identifies the inputs needed of further processing.

4.2 Video Tracking

To carry out video tracking, an algorithm analyses sequential video frames and outputs the motion of objectives among the frames. There are a ramification of algorithms, each having strengths and weaknesses. considering the intended use is critical while selecting which algorithm to use. There are two primary components of a visible tracking gadget: goal illustration and localization, as well as filtering and facts association. Video monitoring is the technique of locating a shifting item (or more than one objects) over the years using a digital camera. It has a style of uses, a number of which might be: human-pc interaction, security and surveillance, video communique and compression, augmented truth, traffic control, clinical imaging and video enhancing.

V. LIBRARIES

Python OpenCV: OpenCV is a widely used python library for computer vision. Its applications are unlimited as it not only does recognise objects captured by the camera but also segregate the required objects from the unnecessary ones. The main objective of OpenCV is to analyze the input feed and then send the required inputs for further processing. OpenCV is used widely for the purpose of AI vision.

NumPy: NumPy provides data structures used to deploy OpenCV with Python. NumPy stands for Numerical Python, is a library consisting of multidimensional array objects and a collection of routines for processing those arrays. NumPy is a python package.

Mediapipe: Mediapipe is a high-fidelity hand and finger tracking solution. Media-pipe is a cross-platform library developed by Google that provides amazing ready-to-use ML solutions for computer vision tasks. Mediapipe tracks and recognizes objects on the screen with great speed and efficiency. Mediapipe has able to achieve this speed because of its use of multi-threading. Such development techniques are generally difficult, but Mediapipe takes the responsibility and executes it.

V. RESULTS

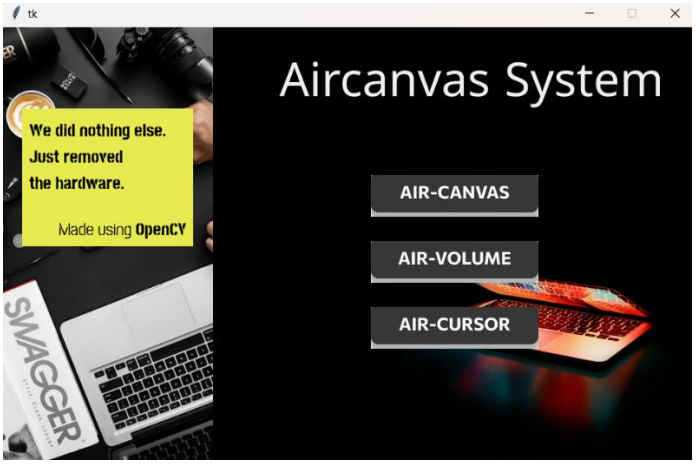

Figure 3: User interface

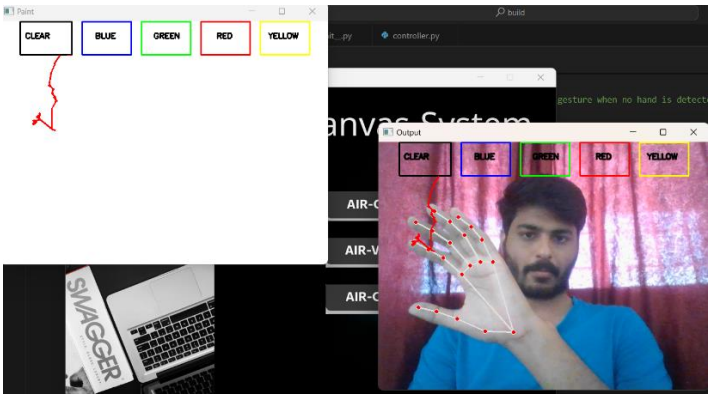

Figure 4: Aircanvas module

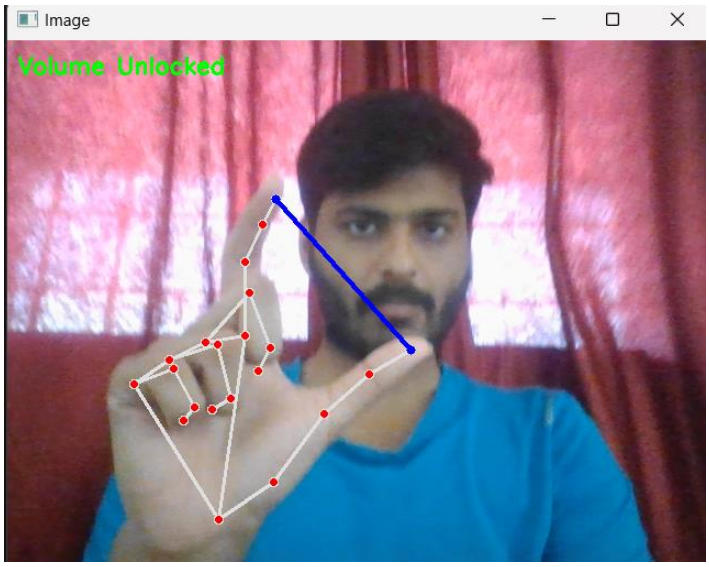

Figure 5: Airvolume module

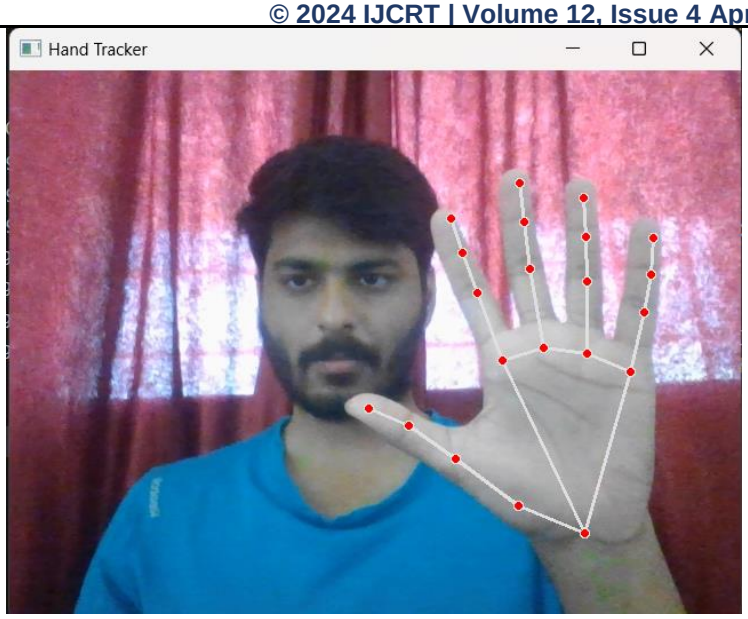

Figure 6: AIrcursor module

VI. CONCLUSION

This project has the potential to update teaching methods in all technical colleges and schools. It can lessen the gap between a poorly funded school and state-of-the-art teaching equipment. not just in the field of education but also in other fields of design. The entire foundation of this endeavor is computer vision. The code will recognize the input as long as it can track the trajectory of the fingertip. Since they are the most often utilized features on all computers, all three of the application's modules are extremely important. Furthermore, the application's performance can be enhanced with the use of cutting-edge smart cameras, which can aid in motion recognition and better motion capture duration.

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