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INTERACTION THROUGH COMPUTER VISION AIR CANVAS

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Abstract: Intelligent user interfaces that can understand the content of what we draw in mid- air can enable for exciting novel sketching applications, and for creating more creative designs and engaging content. To draw your imagination by just waving your finger in air that indeed includes computer vision techniques. In this project we build an air canvas which can draw anything on it by just capturing the motion of a coloured marker with the respective installed camera. The objective here includes colour detection and tracking. Interaction through the computer vision air canvas includes the content and displaying it on the screen using the application by having the different colours included. The different colours enable the user for identification and more clarity.

I. INTRODUCTION

Air Canvas is a hands-free digital drawing canvas that utilizes open CV to recognize text written in air to be made visible on the screen. To create a simple prototype for a drawing tool that uses finger waiving recognition to paint or write on a screen while actually writing or sketching in the air. Using computer vision, we can improve the interaction through interfaces. The direction of the marker is controlled completely using open source OpenCV software and modified to map the pointer finger onto the screen. The idea for Air Canvas was a result of our interest in digital drawing and smart photo recognition software.

There are many ways to visualize the data in order to learn and understand through various techniques like traditional teaching using marker and white board. Due to advancement of technology we moved traditional teaching to online mode where we use interface to deliver the topics. Even during this pandemic situations, online classes have been the basic roots for the education. Using computer vision, we can improve the interaction through interfaces. Here we implement intelligent user interface where we can draw different

sketches using different coloured markers so that everyone can understand and visualize data easily. This project enables the user to sketch or write using the air canvas that is without any contact with the computer and just by waiving your finger in the air. This simplifies the process and any individual can grasp and implement with complete ease.

Free-air gestural interaction is a topic in interaction development with the release of consumer grade hard-wares and other motion tracking technologies. New sensing technologies allow for free-air gestural sensing at low cost. The colour marker is detected and a mask is produced. It includes the further steps of morphological operations on the mask produced which are Erosion and Dilation. Erosion reduces the impurities present in the mask and dilation further restores the eroded main mask.

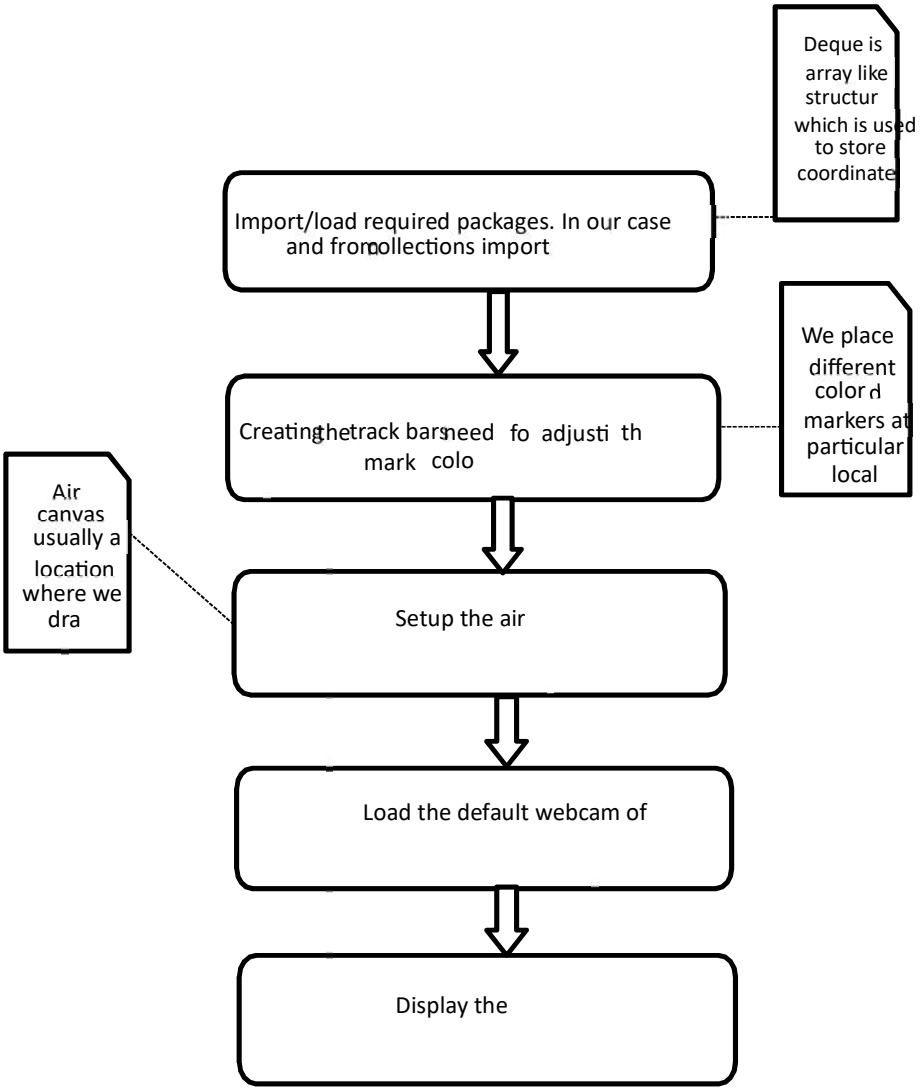
In the era of digital world, traditional art of writing is being replaced by digital art. Digital art refers to forms of expression and transmission of art form with digital form. Relying on modern science and technology is the distinctive characteristics of the digital manifestation. Traditional art refers to the art form which is created before the digital art. From the recipient to analyse, it can simply be divided into visual art, audio art, audio-visual art and audio-visual imaginary art, which includes literature, painting, sculpture, architecture, music, dance, drama and other works of art. Digital art and traditional art are interrelated and interdependent. Social development is not a people's will, but the needs of human life are the main driving force anyway. The same situation happens in art. In the present circumstances, digital art and traditional art are inclusive of the symbiotic state, so we need to systematically understand the basic knowledge of the form between digital art and traditional art. The traditional way includes pen and paper, chalk and board method of writing. The essential aim of digital art is of building hand gesture recognition system to write digitally. Digital art includes many ways of writing like by using keyboard, touch-screen surface, digital pen, stylus, using electronic hand gloves, etc. But in this system, we are using hand gesture recognition with the use of machine learning algorithm by using python programming, which creates natural interaction between man and machine. With the advancement in technology, the need of development of natural ‘human – computer interaction.

II. LITERATURE SURVEY

Regarding the literature survey for the project these are the following points.

Firstly, the current techniques of the similar kind revolve around primary focus on raw sketching interactions. The raw sketching which includes the paint are usually available in any computer or laptops which camera be used for the drawing purpose using the mouse or keyboard.

The second literature survey says that many researchers have proposed numerous methods for marker, electronic, glove- based hand gesture recognition system and also using hand gestures. These have been evolved with time and the create stream of the maker. Though these have been expensive for the common mam to use in their daily use or meet their needs.



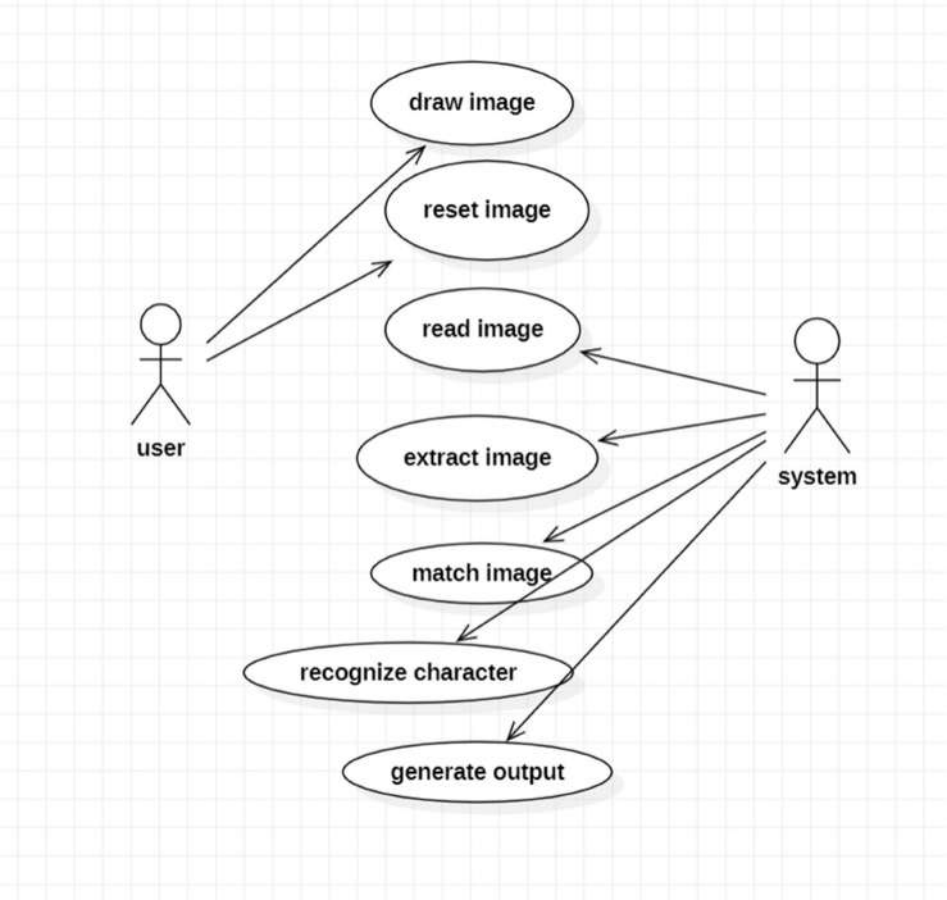


Fig: Use Case Diagram

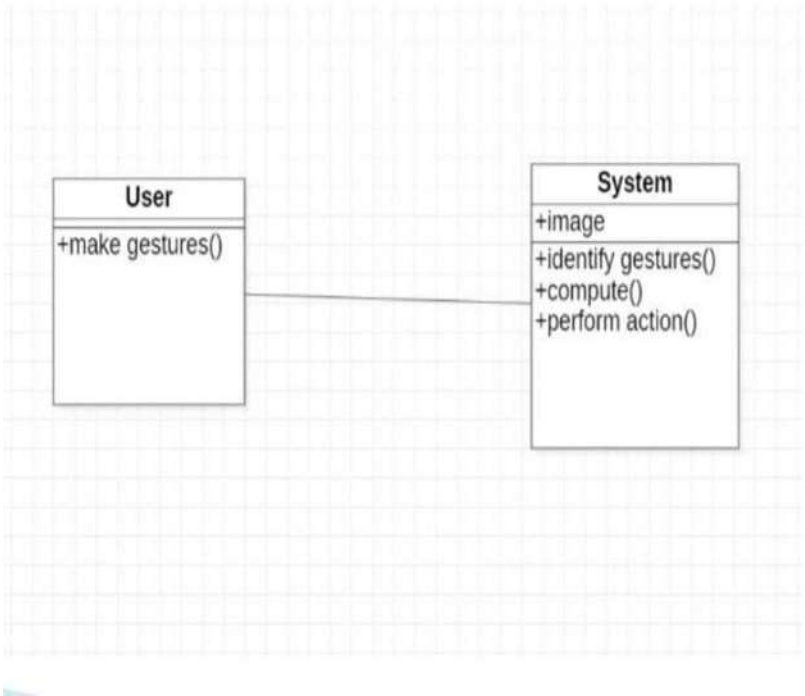


Fig: Class Diagram

Sequence Diagram

A sequence diagram in Unified Modelling Language (UML) is a kind of interaction diagram that shows how processes operate with one another and in what order. It is a construct of a Message Sequence Chart. Sequence diagrams are sometimes called event diagrams, event scenarios, and timing diagrams. A sequence diagram shows object interactions arranged in time sequence. It depicts the objects involved in the scenario and the sequence of messages exchanged between the objects needed to carry out the functionality of the scenario. Sequence diagrams are typically associated with use case realizations in the logical view of the system under development. Sequence diagrams are sometimes called event diagrams or event scenarios.

A sequence diagram shows, as parallel vertical lines, different processes or objects that live simultaneously, and, as horizontal arrows, the messages exchanged between them, in the order in which they occur. This allows the specification of simple runtime scenarios in a graphical manner.

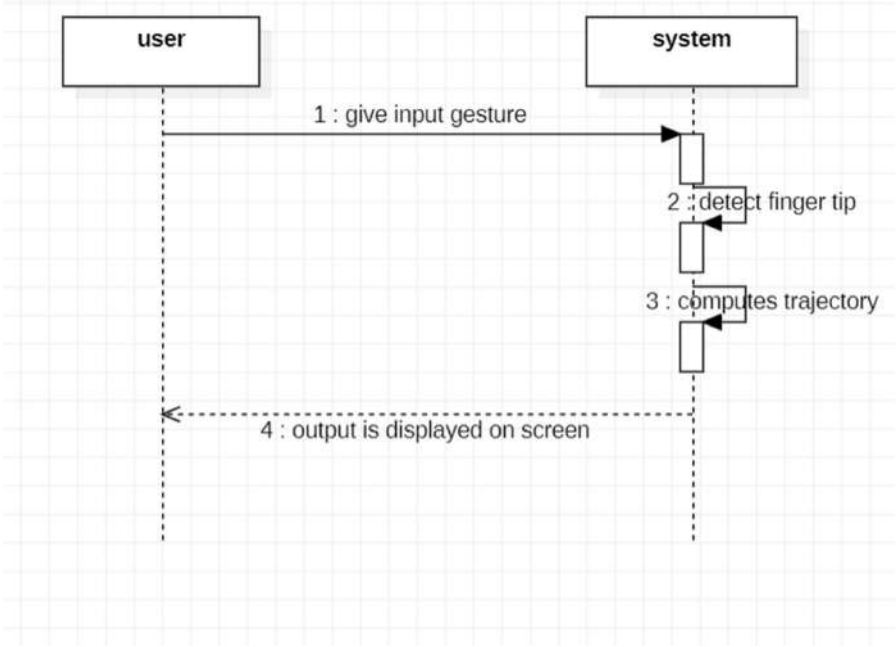
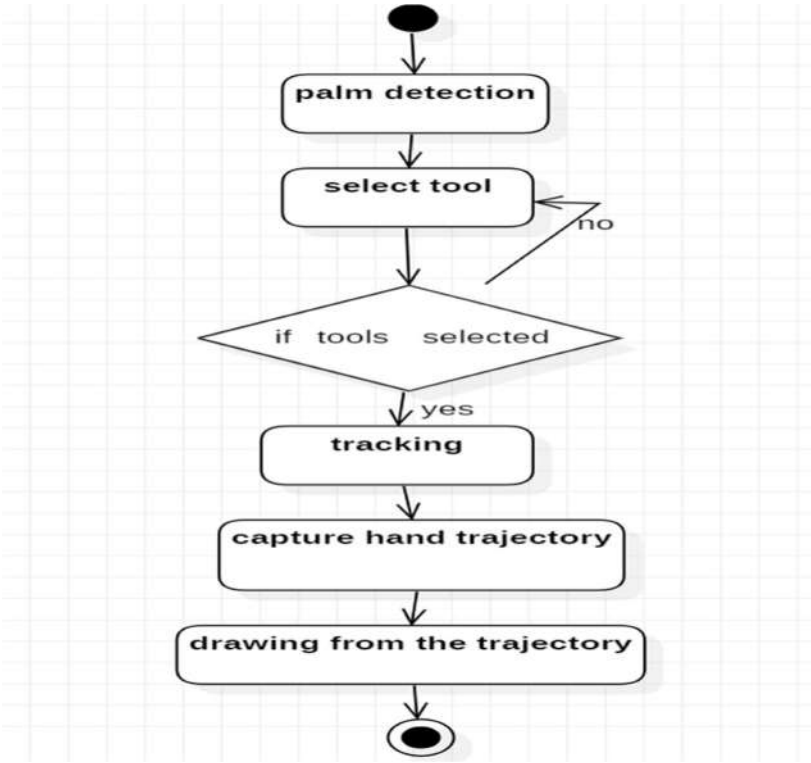


Fig Sequence Diagram

Activity Diagram

Activity diagram is another important diagram in UML to describe the dynamic aspects of the system. Activity diagram is basically a flowchart to represent the flow from one activity to another activity. The activity can be described as an operation of the system. The control flow is drawn from one operation to another. This flow can be sequential, branched, or concurrent. Activity diagrams deal with all type of flow control by using different elements such as fork, join, etc. Activity diagrams are graphical representations of workflows of stepwise activities and actions with support for choice, iteration and concurrency. In the Unified Modelling Language, activity diagrams are intended to model both computational and organizational processes (i.e., workflows), as well as the data flows intersecting.



III. Results Output Screens

Fig:. Output Screen

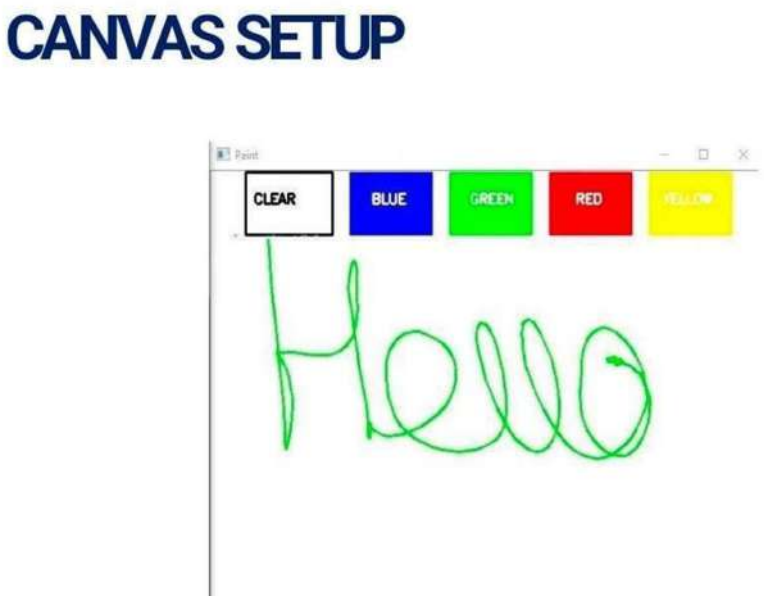


Fig: Canvas Setup

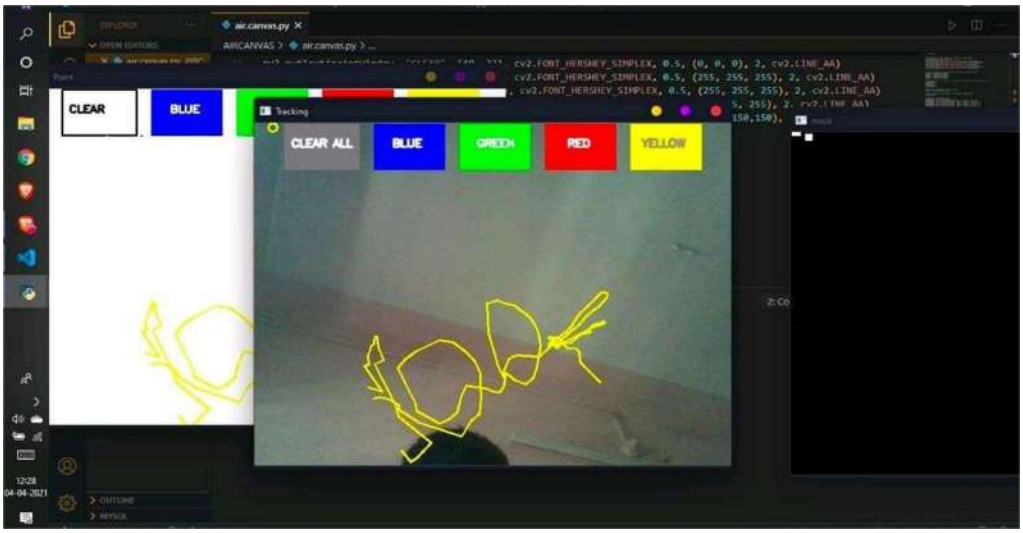


Fig:. Output Display

IV. Conclusion

In this project, with Air Canvas, we have achieved a hands-free drawing program that uses OpenCV to detect the user's pointer finger. With Air Canvas, Colorful lines can be drawn wherever the user desires and the brush can

even be modified. It is truly like drawing in the air. Of course, Air Canvas has many flaws that may be interesting areas of research in the future.

The first is the issue of frame rate: image processing slowed down the camera feed on the usability of the program. It would be best optimized with multicore functionality, which we attempted in this project. Moreover, we relied on open source OpenCV code for hand recognition, which had its own issues that we worked hard to circumvent. This is a simple demonstration of the image processing capabilities of OpenCV. We designed different colored markers for creative design and for multicore functionality content.

The system has the potential to challenge traditional writing methods. It eradicates the need to carry a mobile phone in hand to jot down notes, providing a simple on- the-go way to do the same. It will also serve a great purpose in helping especially abled people communicate easily. Even senior citizens or people who find it difficult to use keyboards will able to use system effortlessly. Extending the functionality, system can also be used to control IoT devices shortly. Drawing in the air can also be made possible. The system will be an excellent software for smart wearable using which people could better interact with the digital world. Augmented Reality can make text come alive. There are some limitations of the system which can be improved in the future. Firstly, using a handwriting recognizer in place of a character recognizer will allow the user to write word by word, making writing faster. Secondly, hand-gestures with a pause can be used to control the real-time system as done by [1] instead of using the number of fingertips. Thirdly, our system sometimes recognizes fingertips in the background and changes their state. Air-writing systems should only obey their master's control gestures and should not be misled by people around.

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