ABSTRACT

ImaginCanvas is a machine learning project that utilizes computer vision to enable users to draw by moving their hands in the air. The system is developed using the Python programming language and popular libraries such as Numpy, Mediapipe, and cv2. The project aims to provide a new and exciting way for users to create digital art using natural hand gestures.

The system uses the mediapipe library for hand tracking and recognition, which allows it to identify hand movements in real-time. By capturing 3D coordinates of the hand using a webcam, ImaginCanvas maps hand gestures to corresponding drawing actions, such as changing color, clearing size, etc.

The project's unique approach to digital drawing opens up new possibilities for creative expression and artistic exploration. ImaginCanvas is intuitive and easy to use, making it accessible to users of all skill levels. It is perfect for individuals looking to experiment with digital art or for educational purposes.

The system's use of machine learning and computer vision technologies ensures accurate tracking and gesture recognition. ImaginCanvas represents a significant step forward in the development of digital art tools, allowing users to create with natural hand gestures in a way that feels similar to traditional drawing and painting.

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CHAPTER 1: INTRODUCTION

The field of digital art has seen significant growth in recent years, with more individuals looking to explore their creativity using digital tools. While traditional digital drawing tools have proven to be effective, they often lack the natural feel of traditional art mediums. This is where the "ImaginCanvas" project comes in, a machine learning-based computer vision project that enables users to create digital art using hand gestures.

The project uses computer vision techniques to track the user's hand movements and recognize specific hand gestures. These gestures are then mapped to corresponding drawing actions such as changing stroke color and size, allowing users to create digital art using natural hand movements. The project is developed using the Python programming language and popular libraries such as Numpy, mediapipe, and cv2.

ImaginCanvas offers a unique and innovative way for individuals to create digital art. Its use of machine learning and computer vision technologies ensures accurate gesture recognition and tracking, while its intuitive interface makes it accessible to users of all skill levels. The project has significant potential for use in education and artistic exploration, offering a new and exciting way to create digital art.

In this project report, we will discuss the development of the ImaginCanvas project, including its architecture, algorithms, and implementation details. We will also present the results of our experiments, which evaluate the system's accuracy, performance, and usability. Finally, we will discuss the project's potential for future development and its impact on the field of digital art.

Overall, ImaginCanvas represents a significant innovation in the field of digital art tools. Its use of machine learning and computer vision technologies offers a new and exciting way for individuals to explore their creativity and create digital art using natural hand movements. The project has the potential to inspire new forms of artistic expression and has significant implications for the development of future digital art tools.

CHAPTER 2: TOOLS

2.1Minimum Requirements:

- **Processor**: Intel/AMD Processor with a base clock of 2.3Ghz or higher
- **Primary Memory:** 2gb or more
- **Space Available:** 4gb or more
- **Graphics:** Integrated with CPU or any external both will work
- **Camera:** External or integrated with minimum 720p resolution

2.2Tech Stack:

- Python v3.8
- OpenCV
- Mediapipe
- NumPy

2.3Software Used:

- PyCharm Community v2022.2.3
- Chrome

CHAPTER 3: IMPLEMENTATION

3.1 How to Run:

1. Check if you have the latest version of python installed.
2. Install all the requisite libraries – NumPy, OpenCV (cv2), Mediapipe
3. Create a virtual environment in your preferred IDE (I used PyCharm)
4. Run the main.py script

Additional Points:

1. Allow webcam access whenever prompted.
2. Setup the virtual env and trouble shoot using the documentation if any issues persist.

3.2Flow Chart:

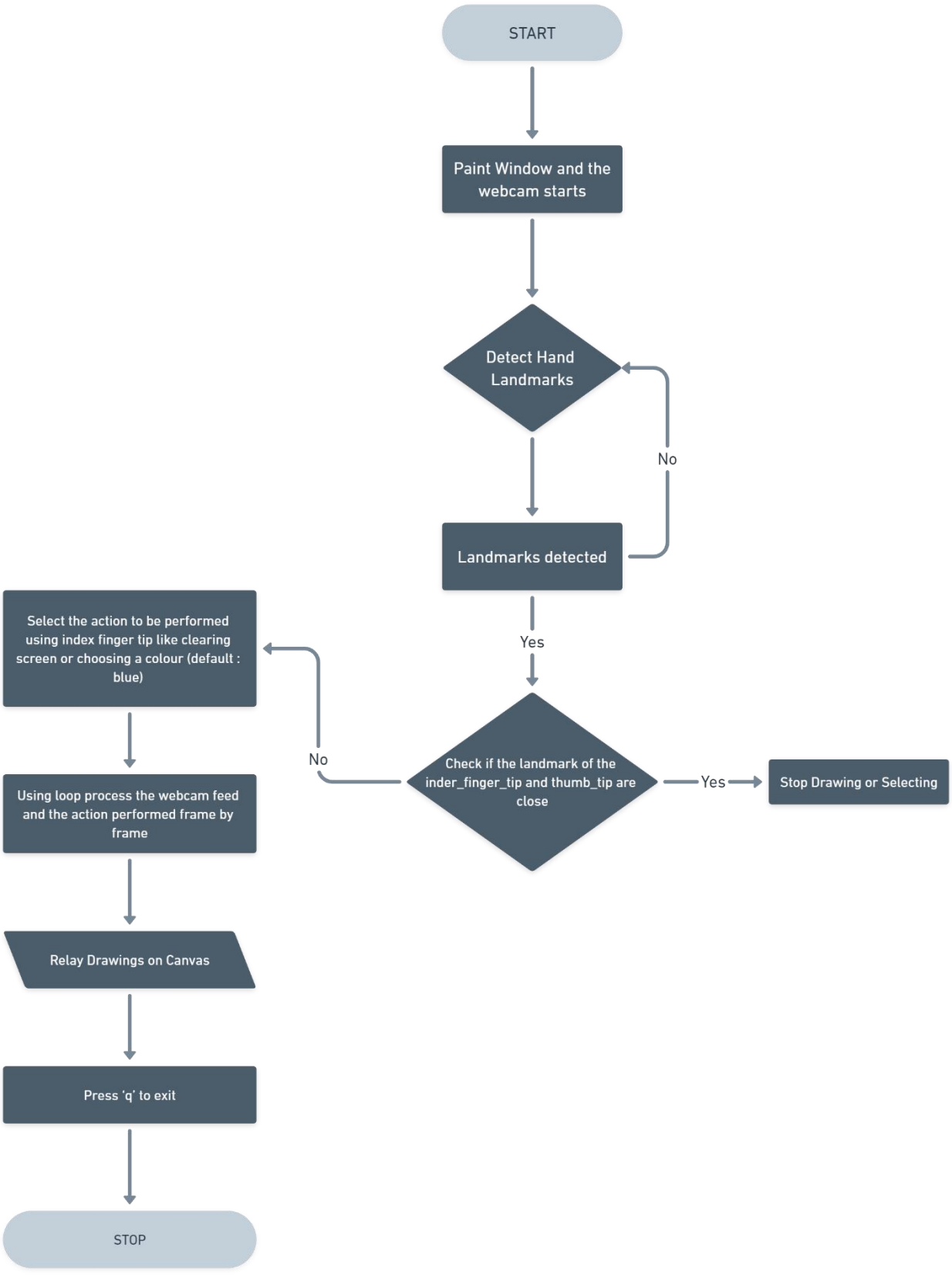

Fig 1:Flow chart

CHAPTER 5: Demonstration

5.1 Start

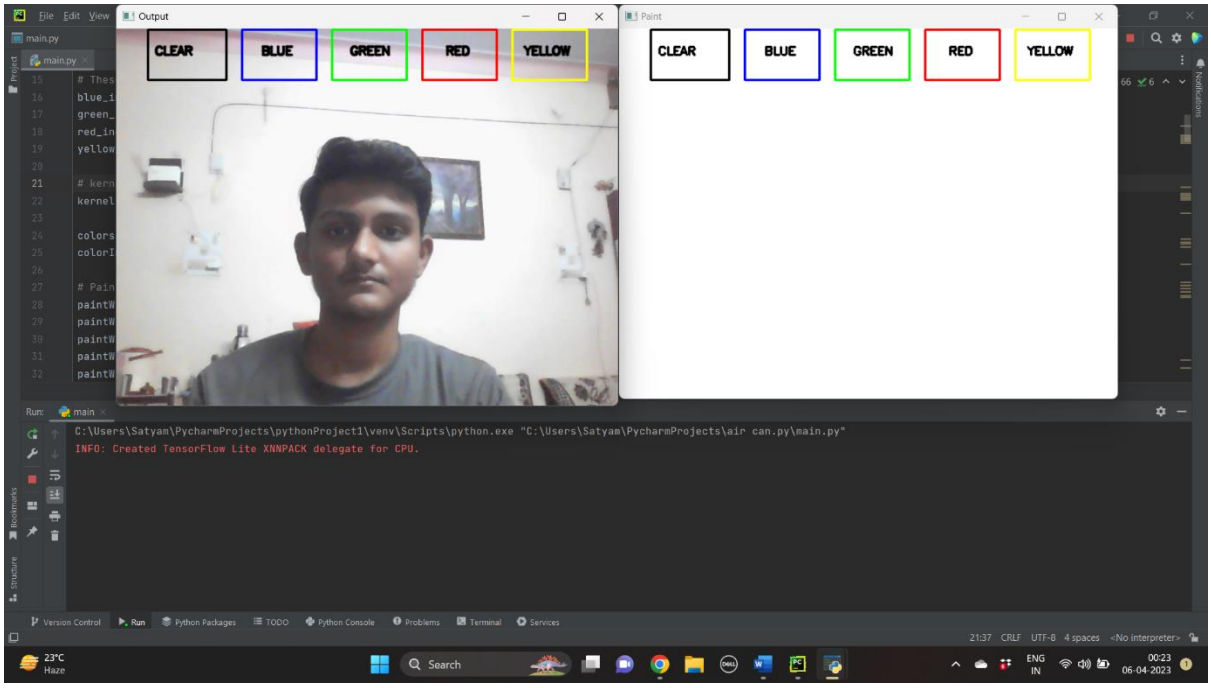

Fig 2:Start Window

As we hit “Run”, the paint and output window pops up and the webcam starts, relaying the camera feed onto the output window. At the beginning the paint window is blank and the default colour selected is Blue (blue_index=1).

5.2 Detecting Hand Landmarks

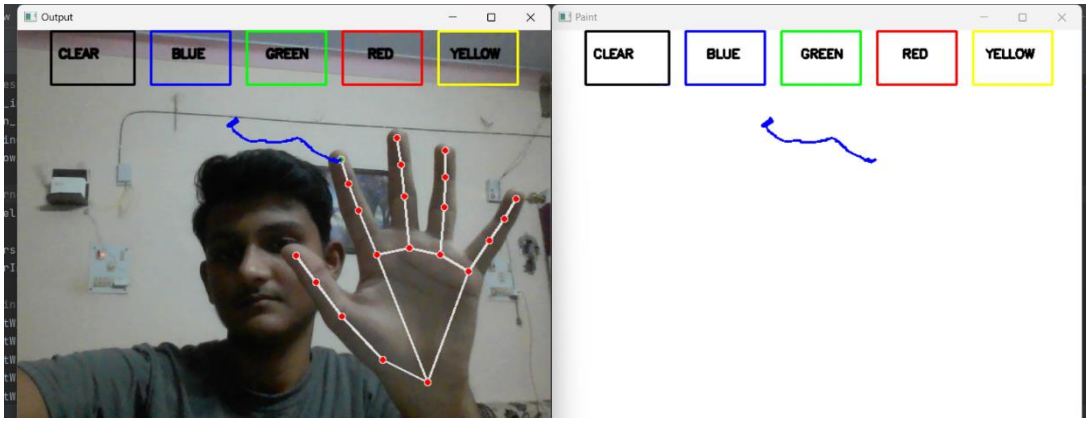

Fig 3: Landmark Detection

As soon as we bring our palm in front of the camera, the machine Learning model ‘Mediapipe’ detects the hand and plots hand landmarks on it. Each joint has a certain landmark and that landmark is used to identify the position. The position of these co-ordinates is stored in deque data structure. The maximum no. of hands that can be detected is **1.**

5.3 Drawing

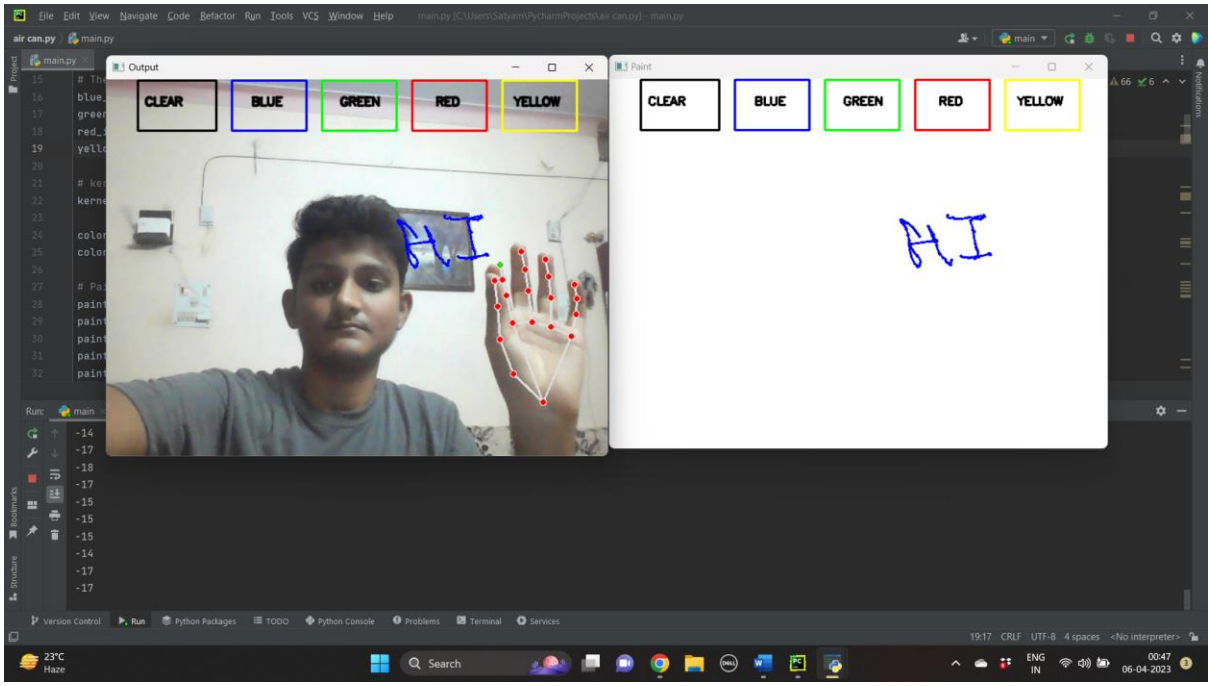

Fig 4: Try it out!!

The tip of the index finger (marked as index_finger_tip) is in green colour because it is the only finger that is used to write. We just need to move the index finger wherever and whatever we want to to draw in air and that motion will be relayed on both the output as well as the paint window. When we want to stop, we can just move our hand out of the frame or we can bring the tip of index finger and thumb close to stop drawing (like a pinching action), this will trigger the stop action.

CHAPTER 6: Conclusion

6.1 Conclusion

In conclusion, the ImaginCanvas project successfully developed a machine learning-based computer vision system that enables users to draw using natural hand gestures. The project utilized the Python programming language and popular libraries such as Numpy, mediapipe, and cv2 to create a highly accurate and responsive drawing experience.

The project represents a significant innovation in the field of digital art tools, offering an accessible and intuitive drawing experience for users of all skill levels. ImaginCanvas's unique approach to digital drawing provides a new and exciting way for individuals to explore their creativity and artistic expression.

The system's use of machine learning and computer vision technologies ensures accurate hand tracking and gesture recognition, making it an ideal tool for individuals with disabilities or those who find traditional digital drawing tools difficult to use.

Overall, the ImaginCanvas project demonstrates the potential of machine learning and computer vision technologies in the field of digital art, offering a glimpse into the future of creative expression. The project opens up new possibilities for artistic exploration and experimentation, and has the potential to inspire a new generation of digital artists.