

AIR CANVAS

TEAM PYTHON THINKERS

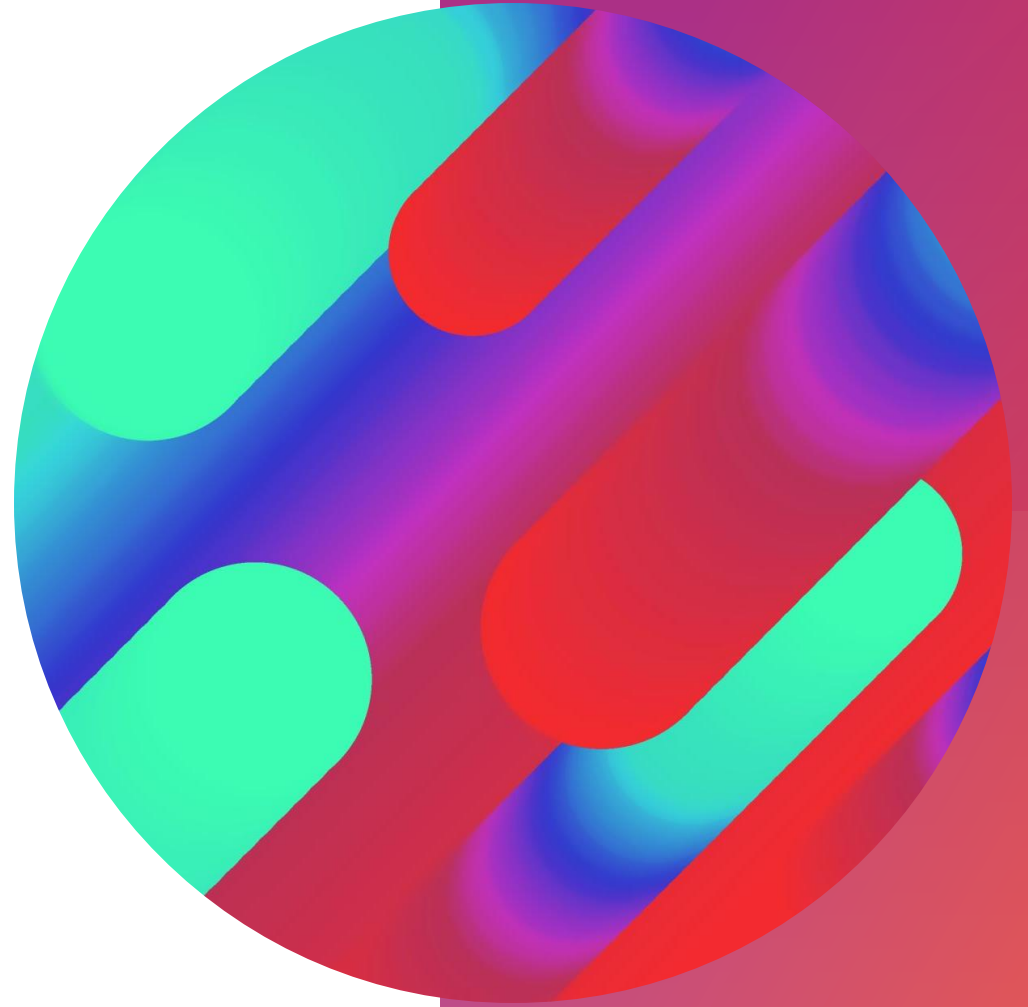
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AGENDA

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INTRODUCTION



AIR CANVAS

- Air canvas is a motion-to-sketch converter that allows us to draw on screen without directly interacting with the system.
- Accomplished with the help of a simple colored cap fitted on our finger.
- We are using the computer vision techniques of OpenCV to build this project.
- The preferred language is python due to its exclusive libraries and easy-to-use syntax.
- We aim to provide a natural human-system interaction so that it does not require a keypad, pen or glove, etc., for character input.

clideo.com



MAIN FEATURES

- It can track any specific-colored pointer
- User can draw in four different colors and even change them without hassle.
- Able to clean the board with a single location at the top of the screen.
- No need to touch the computer once the program is run

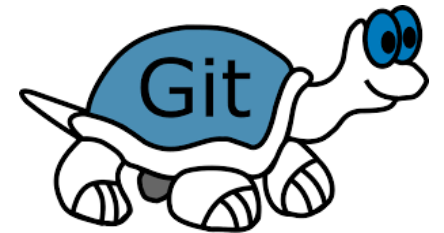


TOOLS REQUIRED



TOOLS USED

- Github (Tortoise Git)
- Slack
- Jira
- Python IDE(pycharm)



PYTHON LIBRARY



NumPy



WORK FLOW

Canvas Creation

Creation of canvas and ink buttons in the web cam layout.

Track Bar Setup

Adjust the trackbar values to locate the colored marker's mask.

Color Detection

Begin by reading the frames and converting them to HSV color space

Mask Creation

Using morphological techniques: Dilation and erosive erosion

Contour Detection

Detect the contours, locate the center coordinates of the most significant shape, and store them in the array for subsequent frames.

Drawing on Canvas

Draw the points saved in an array on the frames and canvas using drawing functions

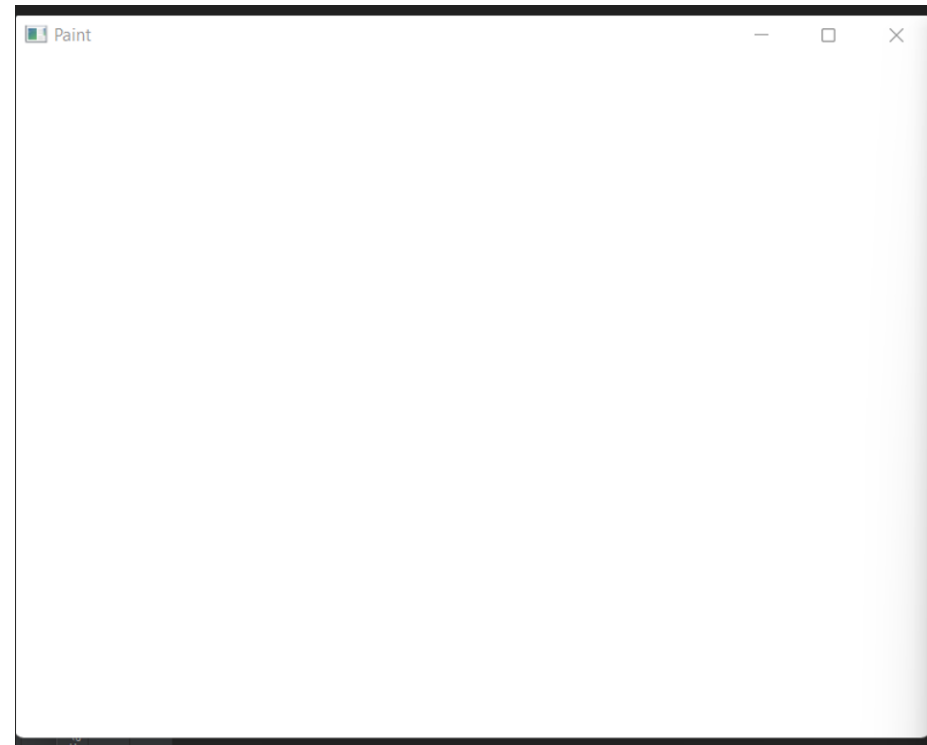


MODULES



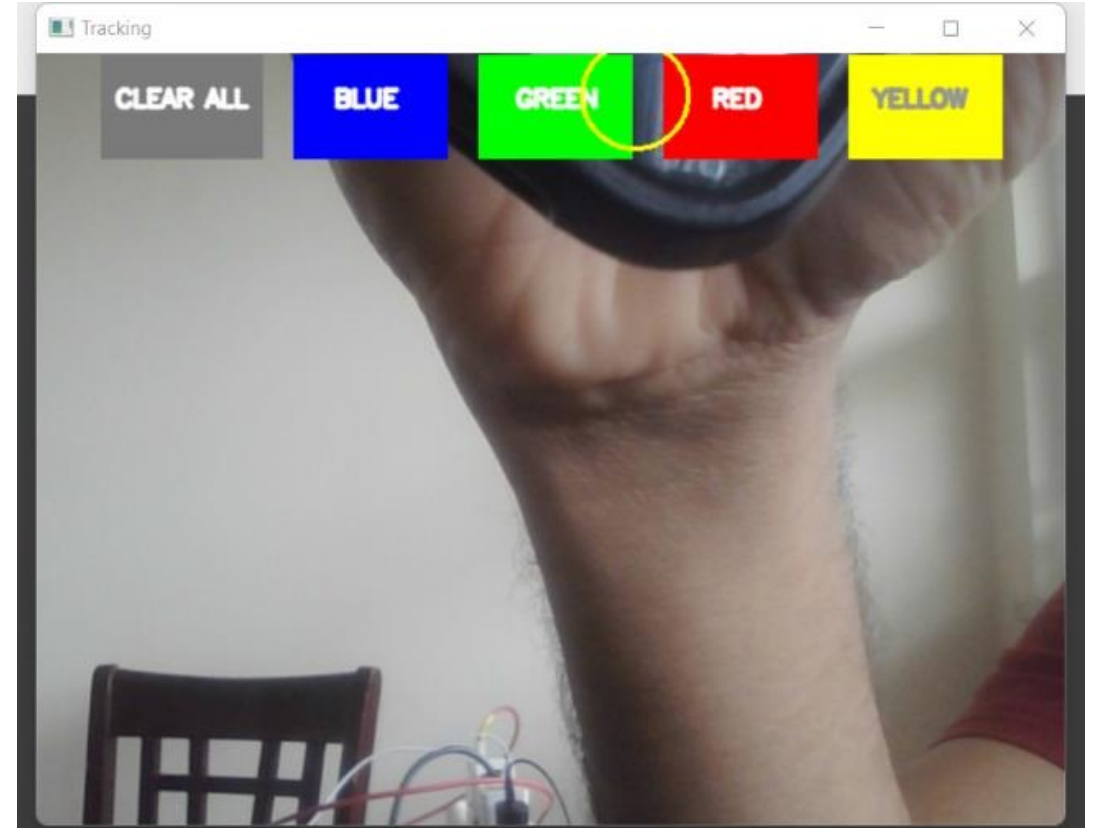
CANVAS CREATION

- Canvas refers to the workspace where the input is accounted for.
- Assigned individual tasks and decided the duration of each task
- We coded a resolution workspace of 471x636 pixels with three color stages, making it a 3-layer matrix.
- Implemented the window np. zeroes function



COLOR BUTTONS

- Mainly 5 buttons: clear all, blue, green, red, yellow.
- Clear all buttons to erase all the drawings on the canvas.
- Hovering on the top of the color button changes the drawings' color.



TRACKBAR CREATION

- Trackbar is created to set the color to be detected.
- createTrackbar function is used to create, and setTrackbarPos is used to set the values.



COLOR DETECTION

- To detect the colored object at the tip of the finger, the incoming image from the webcam is first transformed into the HSV color space.
- RGB color space was used before, but for detecting various shades of the same color, HSV color space is the best possible solution.
- In HSV color space, apart from color value, extra attributes hue and saturation identify more shades of color.



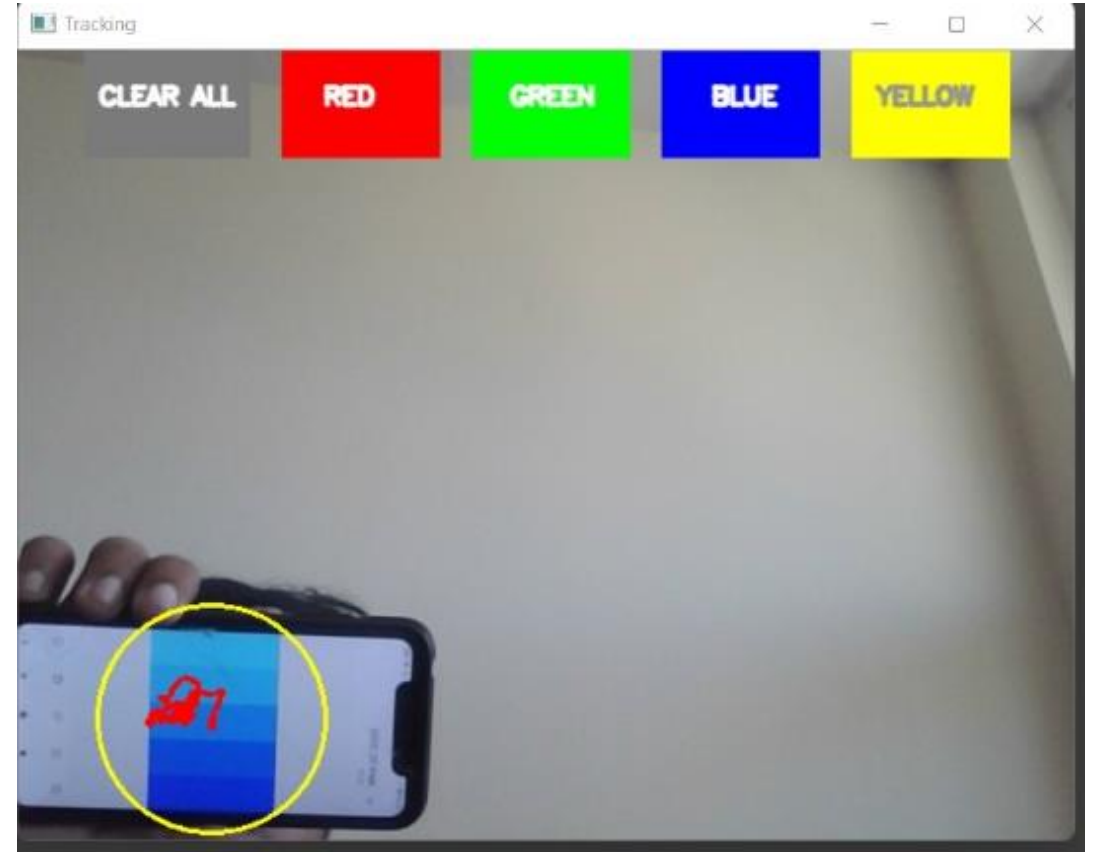
MASK CREATION

- Mask is a black-and-white picture with white pixels in the appropriate color locations.
- Using OpenCV, the mask is created to detect the target color.
- Morphological operations like dilation and erosion are performed to improve the accuracy of the color detection.



CONTOUR DETECTION

- After color detection, multiple colored objects may be present, and only the contour with the highest area will be detected as the colored object.
- Python has a collections library to calculate the area in OpenCV applications.
- Only the center pixel or point is taken for plotting.
- A data structure called deque is used for storing the central coordinates of the real-time movement of the contour



DRAWING ON CANVAS

- The deque save the position of the contour on each subsequent frame, and we utilize these points to draw a line with OpenCV drawing algorithms.
- We use the contour's position to determine whether we want to click a button or draw on the sheet. Some of the buttons have been positioned on the top of Canvas; when the pointer enters their area, their method will be triggered.



CHALLENGES

Challenges

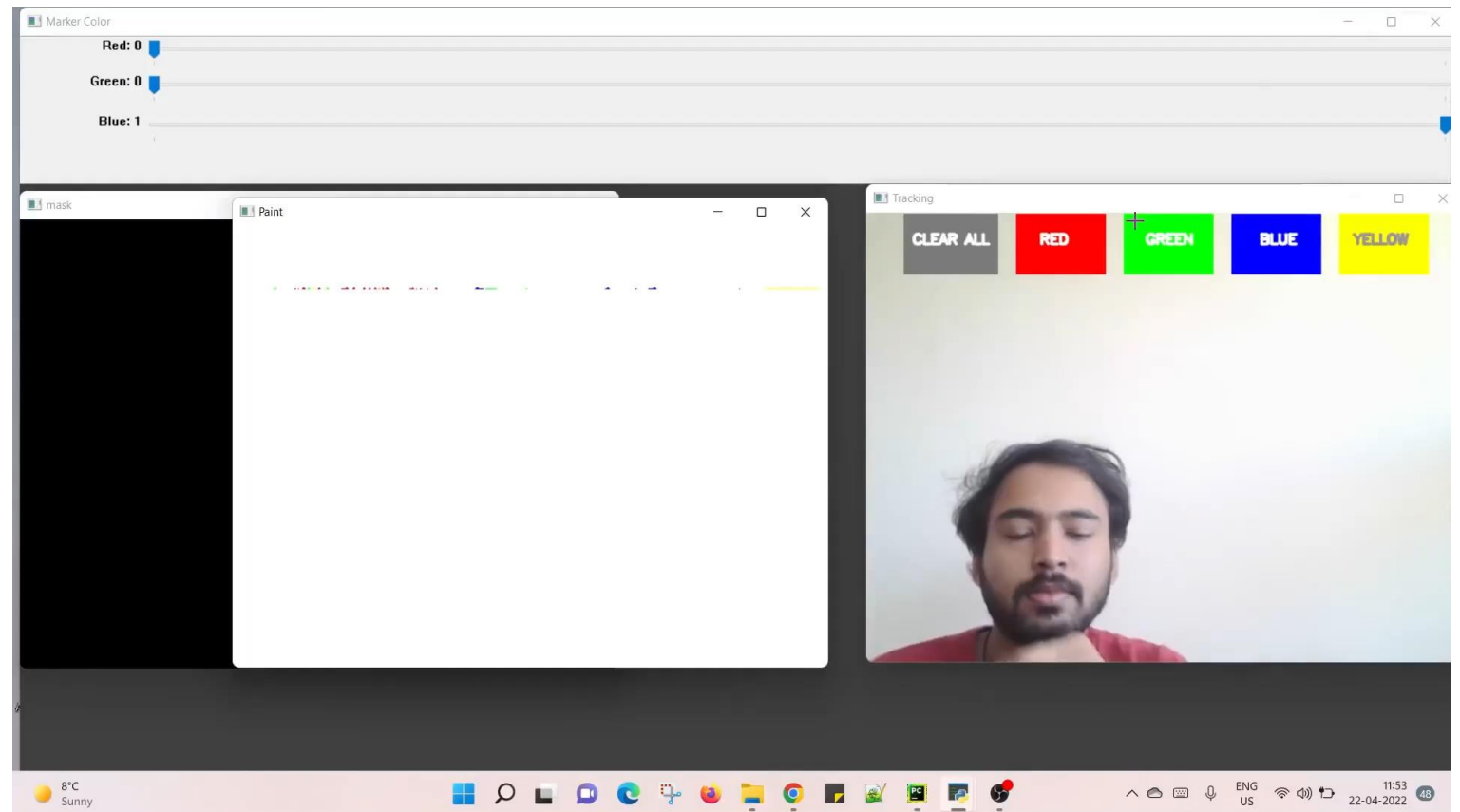
- Finger-tip detection
- Color detection:
 - Inaccurate detection
 - Multiple colored object detection

Solution

- Used Colored object at finger-tip
- Used HSV values instead of RGB & took the object having the highest area



DEMO



LIMITATIONS

Back-tracing of hand movements.

Drawing in 3D space.



FUTURE WORK

Eliminate back-tracing of hand movements to increase the accuracy of the drawings.

Integrating ML models to recognize text written using hand gestures.



CONCLUSION



Successfully implemented Air Canvas, enabling users to draw on a digital canvas using hand gestures.



By developing a computer vision project, python library OpenCV and functions used in the library were familiarized.



Implementing the Air Canvas project increased our knowledge base in computer vision applications.



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THANK YOU

