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Air Drawing Using Python

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ABSTRACT

This paper depicts the reproduction of air drawing using python which is simple computer vision-based project which tracks a target and uses the said target to draw on air. The motion of the target is captured by a webcam. The video from the webcam is processed by the computer to get an AR like image overlay on top of the live footage. This project makes use of a web cam to track the motion of the target.

Keywords: OpenCV, HSV, RGB, Threshold, Python

I. INTRODUCTION

In today's worlds everyone wants an easy way. This project will help to easily draw and write using webcam only. No optical device will be needed, therefore no extra cost. This project will help teachers in the era of online teaching to write just using hand gesture making it easy for them to teach. Explaining things become easier when you are able to write and draw conveniently just by using hand gesture. Each frame in the video is blurred using Gaussian blur to get a smooth image. The blurred image is then analysed to get the location of the pointing target. The image is then masked and centroid of target is found. Then a line is drawn from current frame to the previous frame. We will be using the computer vision techniques of OpenCV to build this project. The preferred language is Python due to its exhaustive libraries and easy to use syntax but understanding the basics it can be implemented in any OpenCV supported language. Colour Detection and tracking are used in order to achieve the objective. 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.It is stable and is applicable as a stand-alone system. In this project, we design a real-time human computer interaction system based on hand gesture. The whole system consists of three components: hand detection, gesture recognition and human-computer interaction (HCI) based on recognition. Also, we summarize and discuss the main works proposed so far. The overall model is designed to be a simple gestural interface prototype for various PC applications.

II. INTRODUCTION TO PYTHON AND OPENCV

Python is a general-purpose interpreted, interactive, object-oriented, and high-level programming language. It was created by Guido van Rossum during 1985- 1990. Like Perl, Python source code is also available under the GNU General Public License (GPL). This tutorial gives enough understanding on Python programming language. Python is a high-level, interpreted, interactive and object-oriented scripting language. Python is designed to be highly readable. It uses English keywords frequently where as other languages use punctuation, and it has fewer syntactical constructions than other languages. OpenCV is an open-source computer vision library. The library is written in C and C++and runs under Linux, Windows and provides interfaces for Python, Ruby, MATLAB and other languages. OpenCV library contains abundant advanced math functions, image processing functions, and computer vision functions that span many areas in vision.

III. METHOD OVERVIEW

We aim to detect text written in the air using a certain object from the real time video. This will involve: - Detecting the object. Tracking the movement. Analysing the detected path to obtain the text. Extracting the Coloured Object: With the help of Reading the frame and extracting the RGB values. Thresholding the image for a range of desired colour and then Extracting the green object. Thisworking is explained as. Colour Tracking of Object at Fingertip First of all, the incoming image from the webcam is to be converted to the HSV colour space for detecting the coloured object at the tip of finger. Converting the incoming image to the HSV space, which is very suitable and perfect colour space for colour tracking.We will make the Trackbars to arrange the HSV values to the required range of colour of the coloured object that we have placed at our finger. The various HUE and other ranges of different colour can be seen here.When the trackbars are setup, we will get the real time value from the trackbars and create range. This range is a NumPy structure which is used to be passed in the function cv2.inrange(). This function returns the Mask on the coloured object. This Mask is a black and white image with white pixels at the position of the desired colour.Contour Detection of the Mask of Colour ObjectNow, after detecting the Mask in Air Canvas, Now is the time to locate its centre position for drawing the Line. We are performing some morphological operations on the Mask, to make it free of impurities and to detect contour easily.Drawing the Line using the position of Contour Now Comes the real logic behind this Computer Vision project, we will form a python deque (A data Structure). The deque will store the position of the contour on each successive frame and we will use these stored points to make a line using OpenCV drawing functions. Firstly, Make Four deques, for four distinct colours of the project. Now, we will use the position of the contour to make decision, if we want to click on a button or we want to draw on the sheet. We have arranged some of the buttons on the top of Canvas, if the pointer comes into their area, we will trigger their method. We have four buttons on the canvas, drawn using OpenCV.

- Clear: Which clears the screen by emptying the deques.
- Red: Changes the marker to red colour using colour array.
- Green: Changes the marker to greencolour using colour array.
- Yellow: Changes the marker to yellowcolour using colour array.
- Blue: Changes the marker to bluecolour using colour array.

Also, to avoid drawing when contour is not present, we will Put a else condition which will capture that instant. Drawing the Line using the position of Contour. Now we will draw all the points on the positions stored in the deques, with respective colour

IV. RELATED WORK

i. **Bimanual Approaches to Drawing Lines**Our bimanual approach to drawing lines builds on tape drawing, which was first introduced in digital form by Balakrishnan et al.and later extended to a 3D application. This 3D implementation required two 2D curves to be drawn to construct a single 3D curve. High degree-offreedom input devices have also been used to create 3D curves using a similar two-step approach. This approach is practical and potentially preferable in some applications in industrial design, where parts fit together and curves can be constructed based on constraints imposed by related curves. However, a more direct, 3D approach to constructing curves is desired for depicting organic subjects in an illustration style. Our technique introduces a form of tape drawing based on true 3D input coupled with haptic constraints.

ii. **Machine Learning and Augmented Reality based Writing in Air**This project was an attempt at developing an object detection and tracking system. The project delivers an implemented tracking system.This project shows the methods of Image processing and detecting an object in it based on its specific colour, by using OpenCV real time implementation is possible. Thresholding of the generated image is necessary in order to segment the image pixels and let them free from each other.

V. FUTURE ASPECT

Future work will include adding different front and text size to your writing. Better precision to whatever we draw or write. Improved response time for more sophisticated working.Virtual mouse controller may also be implemented by time, controlling the movement of mouse pointer on the computer screen virtually just by waving our hands.Adding special gesture for special symbols.

VI. CONCLUSION

Prototype system for air drawing is successfully implemented and tested. The test results show that the drawing method used in the paper can accurately detect and trace any object in real time. This project shows the methods of Image processing and detecting an object in it based on its specific colour, by using OpenCV real time implementation is possible. Python has been preferred over MATLAB for integrating with OpenCV because when a MATLAB program is run on a computer, it gets busy trying to interpret all that MATLAB code as MATLAB code is built on Java. OpenCV is basically a library of functions written in C\C++. Future work includes so many possibilities related to the hand gestures recognition, virtual mouse controller, and also the face detection and recognition.

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