AIR CANVAS

03CS6902 Mini Project
Design Report

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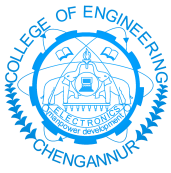

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Abstract

This paper presents a real time video based pointing method which allows sketching and writing of English text over air in front of camera. Proposed method track the colored finger tip in the video frames and Here Colour Detection and tracking is used in order to achieve the objective. The colour marker in 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.

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Chapter 1

Introduction

1.1 AIR CANVAS

Air canvas helps to draw on a screen just by waiving your finger fitted with a colorful point or a simple colored cap. 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.

1.1.1 PROBLEM STATEMENT

Ever thought, waiving your finger into the air can draw on a real canvas. How this air canvas in Computer Vision Projects works.

1.1.2 PROPOSED SOLUTION

In this computer vision project that is a Air canvas which helps to draw on a screen just by waiving your finger fitted with a colorful point or a simple colored cap. It was OpenCV which came to the rescue for these computer vision projects.The proposed method provides a natural human-system interaction in such way that it do not require keypad, stylus, pen or glove etc for character input.

1.1.3 FEATURES OF AIR CANVAS

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

Chapter 2

Project Design

2.1 PROJECT DESIGN

Ever wanted to draw your imagination by just waiving your finger in air.Here we will learn to build an Air Canvas which can draw anything on it by just capturing the motion of a coloured marker with camera. Here a coloured object at tip of finger is used as the marker.

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.

Here Colour Detection and tracking is used in order to achieve the objective. The colour marker in 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.

STEPS IN DETAIL:

1. 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 colored object at the tip of finger. The below code snippet converts the incoming image to the HSV space, which is very suitable and perfect color space for Color tracking.Now, We will make the Trackbars to arrange the HSV values to the required range of color of the colored object that we have placed at our finger.ow, When the trackbars are setup, we will get the realtime 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 colored object. This Mask is a black and white image with white pixels at the position of the desired color.

2. Contour Detection of the Mask of Color Object Now, After detecting the Mask in Air Canvas, Now is the time to locate its center position for drawing the Line. Here, In the below Snippet of Code, We are performing some morphological operations on the Mask, to make it free of impurities and to detect contour easily.

3. 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. 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 color using color array.
Green : Changes the marker to Green color using color array.
Yellow : Changes the marker to Yellow color using color array.
Blue : Changes the marker to Blue color using color array.
Also, to avoid drawing when contour is not present, We will Put a else condition which will capture that instant.

4. Drawing the points
Now we will draw all the points on the positions stored in the deques, with respective colour.

2.1.1 ALGORITHM

1 .Start reading the frames and convert the captured frames to HSV colour space.(Easy for colour detection)
2.Prepare the canvas frame and put the respective ink buttons on it.
3.. Adjust the trackbar values for finding the mask of coloured marker.
4.Preprocess the mask with morphological operations.(Erotion and dilation)
5.Detect the contours, find the center coordinates of largest contour and keep storing them in the array for successive frames .(Arrays for drawing points on canvas)
6.Finally draw the points stored in array on the frames and canvas .

2.2 HARDWARE AND SOFTWARE REQUIREMENTS

Operating System : Any Operating System
Supporting software : Python,Numpy,Opencv
Processor : Intel Core i5 7th Gen 2.50GHz
RAM : 8GB
Monitor : Any colour monitor

Chapter 3

Project Progress

Below are the work done so far:
1. Studied the reference paper.
2. Installed Python and started learning it.
3. Gone through design concepts.
4.Prepared the steps and algorithms.
5. Made the design of the project.

3.1 WORK SCHEDULE

Schedule of completed work (till august10)
1. Study the reference paper well.
2. Check for other papers related to this topic.
3. Analyse other methods (if any found from related papers) which can be used in this project.
4. Install Python and start learning it.
5. Prepared the steps and algorithms.
6. Make a vague design of the project.

Work scheduled for coming time period
1. Start the implementation.
2. Complete the implementation of each step

2.1 Understanding the HSV (Hue, Saturation, Value) color space for Color Tracking. And tracking the small colored object at finger tip.

2.2 Detecting the Position of Colored object at finger top and forming a circle over it. That is Contour Detection.

2.3 Tracking the fingertip and drawing points at each position for air canvas effect. That is Frame Processing.

2.4 Fixing the Minor Details of the code to function the program smoothly. Algorithmic Optimization.

3. Complete the entire coding and test it.
4. Check the performance of the project.
5. Prepare for the final presentation.

References

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[3]]A Novel Human-3DTV Interaction System Based on Free Hand Gestures and a Touch-Based Virtual Interface by SHUN ZHANG AND SHIZHOU ZHANG IEEE Sensors J., vol. 19, no. 20,pp. 95049511, Oct. 2019.