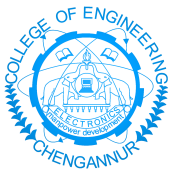
AIR CANVAS

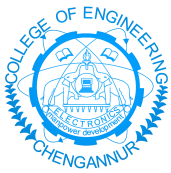
03CS6902 Mini Project

CHN20CSIP06 SHIVANGI M
meshivu97@gmail.com
M. Tech. Computer Science & Engineering (Image Processing)



Department of Computer Engineering
College of Engineering Chengannur
Alappuzha 689121
Phone: +91.479.2165706
http://www.ceconline.edu
hod.cse@ceconline.edu

College of Engineering Chengannur
Department of Computer Engineering



C E R T I F I C A T E

This is to certify that, this report titled ***AIR CANVAS*** is a bonafide record of the work done by

CHN20CSIP06 SHIVANGI.M

Second Semester M. Tech. Computer Science & Engineering (Image Processing)

student, for the course work in **03CS6902 Mini Project**, under our guidance and supervision, in partial fulfillment of the requirements for the award of the degree, M. Tech. Computer Science & Engineering (Image Processing) of **APJ Abdul Kalam Technological University**.

Guide

Radhu K
Asst. Professor
in Computer Engineering

Coordinator

Ahammed Siraj K K
Associate Professor
in Computer Engineering

Head of the Department

October 4, 2021

Dr. Smitha Dharan
Professor
in Computer Engineering

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Acknowledgements

Primarily, I thank Lord Almighty for his eternal support through out my project work.
I express my sincere thanks to Dr. Jacob Thomas V., Principal, College of Engineering Chengannur for extending all the facilities required for doing my mini project. My heartfelt words of gratitude to Dr. Smitha Dharan, Professor and Head of Department of Computer Engineering, for providing constant support.
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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.

Contents

Chapter 1

Introduction

1.1 AIR CANVAS

Air canvas helps to draw on a screen just by waving 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

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

1.1.2 PROPOSED SOLUTION

In this computer vision project that is an Air canvas which helps to draw on a screen just by waving 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. 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

Report of Preparatory Work

2.1 LITERATURE SURVEY REPORT

2.1.1 Ayushman Dashz, Amit Sahuz, Rajveer Shringiz, John Gamboax Muhammad Zeshan Afzalx,and Andreas Dengely"AirScript Creating Documents in Air" 14th IAPR International Conference on Document Analysis and Recognition (ICDAR) IEEEXplore2017

Present a novel algorithm, called 2-DifViz, that converts the hand movements in air (captured by a Myo-armband worn by a user) into a sequence of x; y coordinates on a 2D Cartesian plane, and visualizes them on a canvas.The recognition module consists of a Convolutional Neural Network (CNN) and two Gated Recurrent Unit(GRU) Networks.The output from these three networks is fused to get the final prediction about the characters written in air.AirScript can be used in highly sophisticated environments likea smart classroom, a smart factory or a smart laboratory, where it would enable people to annotate pieces of texts wherever they want without any reference surface

2.1.2 Air-writing Recognition, Part 2:Detection and Recognition of Writing Activity in Continuous Stream of Motion Data Mingyu Chen,Ghassan Al-Regib, Senior Member, IEEE, and Biing Hwang Juang, Fellow, IEEE.IEEE transaction on human machines.

It addresses detecting and recognizing air-writing activities that are embedded in a continuous motion trajectory without delimitation. Detection of intended writing activities amongst superfluous finger movements unrelated to letters or words presents a challenge that needs to be treated separately from the traditional problem of pattern recognition.It present a data set that contains a mixture of writing and non-writing finger motions in each recording. The LEAP from Leap Motion is used for marker-free and glovefree finger tracking. a window-based approach is introduced that automatically detects and extracts the air-writing event in a continuous stream of motion data, containing stray finger movements unrelated to writing. Consecutive writing events are converted into a writing segment. The recognition performance is further evaluated based on the detected writing segment.

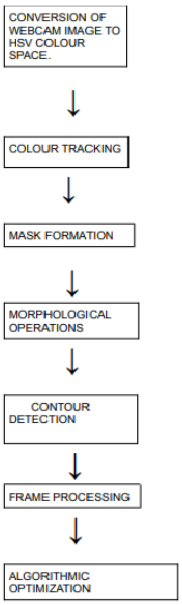
2.1.3 A Novel Human-3DTV Interaction System Based on Free Hand Gestures and a Touch-Based Virtual Interface by SHUN ZHANG AND SHIZHOU ZHANG IEEE Sensors J., vol. 19, no. 20,pp. 95049511, Oct. 2019.

A novel human-3DTV interaction system based on a set of simple free-hand gestures for direct-touch interaction with a virtual interface to facilitate human-3DTV interaction. Here the system projects a virtual interface in front of the user who wears the 3D shutter glass, and the user just stretches the arm and touches the virtual interface like performing on a smart phone with a touch screen, using gestures such as Click, Slide, Hold, Drag and Zoom In/Out.The system projects a virtual interface in front of the user who wears the 3D shutter glass, and the user just stretches the arm and touches the virtual interface like performing on a smart phone with a touch screen, using gestures such as Click, Slide, Hold, Drag and Zoom In/Out.Here system is able to recognize the user's gesture fast and accurately, as the system only needs to search for a small region neighboring the virtual interface for a small set of gesture types. The key gestures using on smart phones, our free-hand gestures can be easily used by anyone with only a brief training. The users feel more comfortable than traditional gesture input methods and can effectively interact with 3DTV using our system.

Chapter 3

Project Design

3.1 PROJECT DESIGN



Ever wanted to draw your imagination by just waving 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.

3.1.1 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 .

3.2 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 4

Implementation

4.1 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. Then Trackbars are made to arrange the HSV values to the required range of color of the colored object that we have placed at our finger. 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 . This function returns the Mask on the colored object..

4.2 Contour Detection of the Mask of Color Object

This Mask is a black and white image with white pixels at the position of the desired color.After detecting the Mask in Air Canvas, locate the center position for drawing the Line. Performing some morphological operations on the Mask, to make it free of impurities and to detect contour easily.

4.3 Drawing using the position of Contour

A python deque (A data Structure) is formed.The deque will store the position of the contour on each successive frame.The position of the contour is used to make decision,if we want to click on a button or want to draw on the sheet. The position of the contour is used to make decision, if we want to click on a button or we want to draw on the sheet. some of the buttons are arranged on the top of Canvas, if the pointer comes into their area, will trigger the method. There are 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.

All the points are drawn on the positions stored in the deques, with respective colour.

Chapter 5

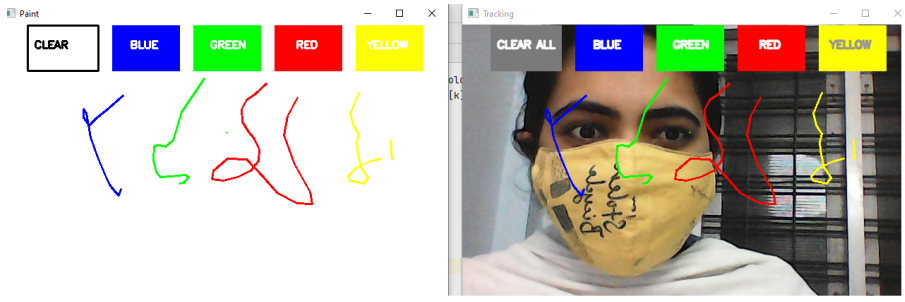
Results & Conclusions

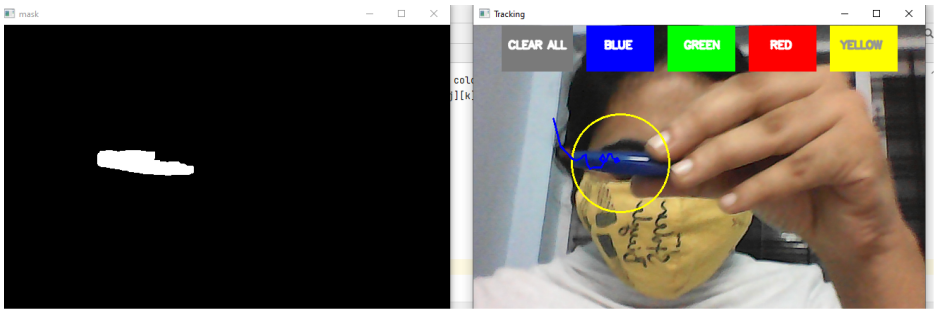
5.1 Conclusion

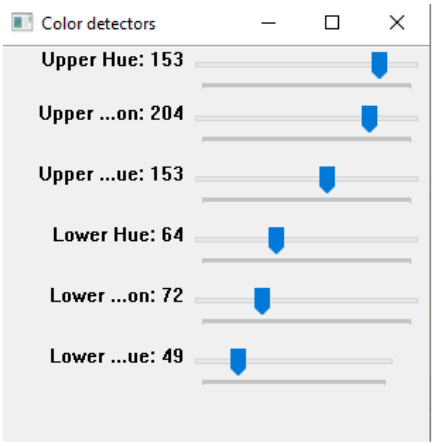
All the four steps are successfully accomplished.Web cam image converted to HSV (Hue, Saturation, Value) color space for Color Tracking. And tracking the small colored object at finger tip. Detected the Position of Colored object at finger tip and forming a circle over it. That is Contour Detection.Tracked the fingertip and drawing points at each position for air canvas effect. That is Frame Processing.Fixed the Minor Details of the code to function the program smoothly. Algorithmic Optimization is done

5.2 Results

The screenshots of the output are given below




mask
Tracking
CLEAR ALL
BLUE
GREEN
RED
YELLOW


Color detectors
Upper Hue: 153
Upper ...on: 204
Upper ...ue: 153
Lower Hue: 64
Lower ...on: 72
Lower ...ue: 49

References

[1] Ayushman Dashz, Amit Sahuz, Rajveer Shringiz, John Gamboax Muhammad Zeshan Afzalx, Muhammad Imran Maliky, Sheraz Ahmedy and Andreas Dengely"AirScript Creating Documents in Air" 14th IAPR International Conference on Document Analysis and Recognition (ICDAR) IEEEXplore2017

[2] Air-writing Recognition, Part 2:Detection and Recognition of Writing Activity in Continuous Stream of Motion Data Mingyu Chen, Ghassan AlRegib, Senior Member, IEEE, and Biing-Hwang Juang, Fellow, IEEE.IEEE TRANSACTIONS ON HUMANMACHINE SYSTEMS.

[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.