ET208: Mini Project 1: S.E. Sem: IV

VIRTUAL NOTEPAD

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Abstract

With the advent of new sensing technologies, touch free-air interaction is becoming viable as a contender for the next generation of expressive, embodied interaction modes. Virtual Notepad is a hands-free digital drawing canvas for creating, recognizing and visualizing documents in air.This project is based on the concept of image processing and computer vision. It works on the principle that converts the hand movements in air, which are captured by a webcam, into a sequence of x, y coordinates on a 2D Cartesian plane, and visualizes them on a white canvas.

Introduction

During the Information Age, the media where documents are created has undergone a fast transition from traditional paper-based methods to any digital device. However, despite the progress, all modern methods are limited in that they restrict the region where the input is received to a given surface of reference.

Here is where Virtual Notepad comes into place. Virtual Notepad gives freedom of movement to the user and provides a real-time visual feedback of the written characters, making the interaction natural. It can be used in highly sophisticated environments like a 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.

Project Goals

1. Wide range of vibrant colors to make it look appealing.
2. Smooth drawing and fast responsive output
3. Screenshot feature for saving and sharing notes quickly and easily.

Project Description

The initial motivation was a need for a dustless class room for the students to study in, but due to lockdown it became a necessity because writing with the help of a cursor is difficult and leads to a handwriting which is difficult to read. Hence it was OpenCV which came to the rescue.

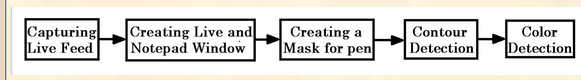

Figure 1: Block diagram

The working of this computer vision project has four major components.

1. Understanding the HSV (Hue, Saturation, Value) color space for **Color Tracking.** And tracking the small colored object at finger tip.
2. Detecting the Position of Colored object at finger top and forming a circle over it. That is **Contour Detection.**
3. Tracking the fingertip and drawing points at each position for virtual canvas board.
4. Adding the features like vibrant colours. clearing the board,screen saving feature to save the canvas for further sharing.

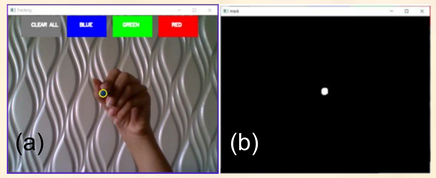

Figure 2: (a) Object detection in live window. (b) Mask of detected object.

Masking is used so that the hand movements or gestures are captured accurately without any noise or disturbance in the image.
Contours are a useful tool for shape analysis and object detection and recognition. The tip of the pen/finger which was visible in the Live window is now encircled by a yellow contour.

Results

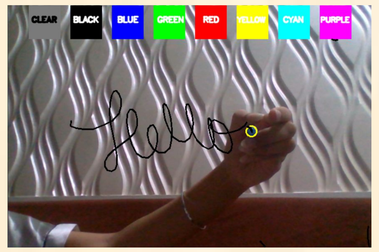

Figure 3: Live WIndow

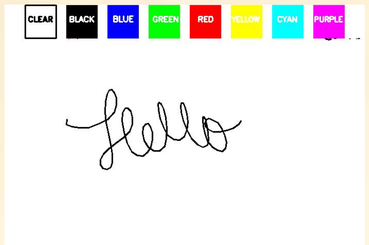

Figure 4: Notepad WIndow

Application

Virtual Notepad can have application in many areas such as, smart factories, smart offices, smart class rooms, virtual reality games and even augmented reality environments.

- **Cheap Solution for education purposes:** As the world is advancing towards a more technologically dependent era and the way of learning is also becoming more digital, but due to financial restraints every school or college cant afford tablets for each student so this could be a great alternative to that .
- **Fun and interactive way of learning :** Due to the corona pandemic we are forced to stay indoors and all the colleges and schools have been working online and due to which sometimes students find it hard to concentrate on the screen and also feel bored. So the idea of a virtual notepad will be a more interactive way of learning.
- **Also used in various fields like 3 - D Modelling and Virtual reality**.

Conclusion

We envision Virtual Notepad to be used in a smart classroom environment using augmented reality, where people can scribble anything as air notes and visualize these notes in the form of handwriting, thus giving the process of creating a new definition.

With Virtual Notepad, we have achieved a hands-free drawing program that uses OpenCV to detect the user's pointer finger. Colorful lines can be drawn wherever the user desires and the brush can even be modified. It is truly like drawing in the air!

Virtual Notepad can be modified by adding handwriting recognition feature to it using Natural Language Processing to detect characters.

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