VIRTUAL AI PAINTER USING OPENCV AND MEDIAPIPE

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1.ABSTRACT

In the present time technologies has been very prerequisite for us. In this we are painting by a human being is a drawing of his sentiment and the responses of the world and deliver a message or giving the statement to the entire of humans who get that part. This prepared data is used for numerous research projects for motive or to show a specific outcome on a particular system. There are different methods for processing and using the data to get the desired result. Utilizing the OpenCV module and mediapipe, we created this application. to make this as a real time application.

An application like this is created using the Python programming language, a top machine learning tool. In this we drawing by capturing hand motion and the interaction between hand and camera. Python is the language that was used for this project and it is more libraries that are extensive and the syntax is simple to utilizing and the fundamentals and need to be utilized in any language that supports OpenCv. Processes for palm detection and colour tracking have been employed to achieve the project's objective. This gap is exploited by the project, which emphasis on creating a converter for moving images to text may be used as software for clothing-mounted computers that the ability to write in the air. In order to write from above, The system will use computer vision to track the movements of the finger. Messages, emails,& other types of communication can all be sent using the created text. The deaf will be able to communicate

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effectively thanks to it. It is an efficient means of communication that decreases the use of cellphones and laptops by doing away with the need to write.

Key phrases: Machine learning, OpenCV, morphing methods, and interactions between people and computers Character Recognition, Object Detection, and Air Writing System for Real-Time Gesture Control, Smart Clothing.

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2.INTRODUCTION

Around 2000 BC, the practice of writing was first discovered. The cave wall was first written on by Neolithic people. Soon after, stone replaced these walls, then fabric, and we now present a written report. In a slow manner transitioning to a form that is primarily digital, based on ability and adapt the technology to exploring it in the serval ways and organizing the electronic text papers created with modern technology. using the QWERTY keyboard, These digital text documents are editable and programmable. electronic text papers created with modern technology. using the QWERTY keyboard, These digital text documents are editable and programmable.. Electronic text and keyboards are gradually displacing traditional writing with pens and paper. With the help of our technology, also known as open cv and mediapipe, it is possible to paint in the air. Virtual AI painter using OpenCV and Mediapipe is an application which prints the motion of an object. By using the great feature to track , the person can draw on the screen by moving the hand by the human in this project in front of the webcam or camera . This is the real time webcam which is introduced by tracking the motion of the object and helps the person to make a things easy which are both fascinating and testing.

OpenCV Stands for Open Source Computer Vision was launched in August 1999 at the Computer Vision and Pattern Recognition conference which is a programming language which contains library of different types of functions only for computer vision. It have almost 3,000 functions and 14 million downloads. We can explain this in a easy language or in a proper way ,it is a library which is used for processing the image properly. It is used to do all the types of operations which is exactly to the occupied images .To create a digital canvas for drawing on. To recognize the color marker left by the human finger. To performing the phonological operations. To design a user interface that connects the human hand to the system.

OpenCV is a library for images and drawing a figure.. It approximately supports all the important programming languages. Mainly opencv is used in python and C++. OpenCv is used to read or write an image in a manner or in a general way and for modification of images. It changes color to gray binary and Hue , Saturation and value etc. It is also open source.

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MediaPipe- enables the development of cross-platform pipelines for the development of unique machine learning techniques for streaming and live media. The graph-based an open source programme for media processing, which Google also made available for download, was in the alpha stage at the time.. Mediapipe aims to make media processing much easier for our by preparing the machine learning features and some joined computer vision [7][8].

There are some of it's important applications that are follows:

1. Palm detection

2. Multi-hand tracking

3. Hand landmarks identification

4. Detecting an object

5. Tracking an object

6. AutoFlip – Autoflip is a pipeline which is used to crop the videos naturally. The two most fundamental morphological processes are erosion and dilation [9][10].
Erosion:-

Removes the foreground object's boundaries.

Usually used to make an image's features less noticeable.

Dilation:

Mostly increases the object area.

Used to make the features get elevated.

Cell phones are no longer necessary with this technique to take notes. Instead, the ability to scribble in the sky requires everyday used of portable equipment.

The drawn word is recognized using finger and movement recognition methods as well as aerial character recognition. The fingertip is initially detected using OpenCV. Then, on a background of black, the fingertip's trajectory is noted and depicted. Handwriting is not our model for aerial photography. It can then be developed into a model for handwriting recognition. The color space utilized in a particular application is crucial to the segmentation process's effectiveness, yet color spaces are sensitive to changes in lighting [11][12].

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3.PREVIOUS RELATED THEORY

A screen is an active device that does totally what is questioned and it shows the data. There are multiple ways to get this and the keyboard which is a conventional and globally used method to show the data on the given screen and a keyboard is a collections of buttons which is used to make the letters, numbers and the symbols, and also present some extra functions but it also has a few drawbacks such that it is a slow method whenever you are in need to write a lengthy piece of writing and there are also some quick ways such as scanning and copying. it might lead to different errors that may frequently be due to misconstruction and it could always be transformed between homographs [13][14][15].

There is a next method which is a touchscreen method and it is having a computer screen that can be used by touching it with a human finger or with a needle pen and instead of working with a mouse and a keyboard. We can also define it as a touchpad and a screen which is inbuilt in it. There are some drawbacks that they ain't worthy for taking input in a large quantity of data which are not very exact or correct and also selects full objects which can be hard with human fingers and this very much costly than others such as a mouse and very soon it may become wrong if it will be embezzle.

Accurate Hand Recognition Using the Kinect Sensor

The technique suggested in [3] utilized the Kinect sensor's colour and depth information to recognize the shape of the hand. Regardless of the Kinect sensor, gesture recognition is still possible. It remains a really difficult problem. This Kinect sensor only has a 640480 resolution. When tracking a big object, like the human body, it works well. But it's difficult to follow something as small as a finger [16][17].

LED fitted finger movements

The method described by the authors in [4] involves mounting an LED a user's finger and using the webcam to follow the finger. The drawn character is in contrast to the one in the database. The word order that matches the pattern is returned. It calls for attaching a red LED pointed at the finger as a source of illumination. Additionally, it is believed that nothing else in the web camera's field of vision is red in colour but the LED light.

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Augmented Desk Interface

A proposed enhanced segmented desk interface for interaction can be found in [5]. This technology uses a camera with a charge-coupled device (CCD) and video projector in order for people to utilize desktop programmes with just their fingertips. Each hand in this mechanism carries out a separate function. Radial menu selection requires the usage of the left hand [18][19].

4.SYSTEM DESIGN

Writing Hand Pose Detection

Acknowledging an important stage is to recognize the generating hand's position, as well as accept that through the other signals is an essential step in determining to create an airborne. And all the conventional writing, whenever the write goes down, and the write moves upward, creating it within the discussion is not assigned out as an arrangement of this writing incident . The Main framework acknowledges the location of that hand recognizing the supplied amount.
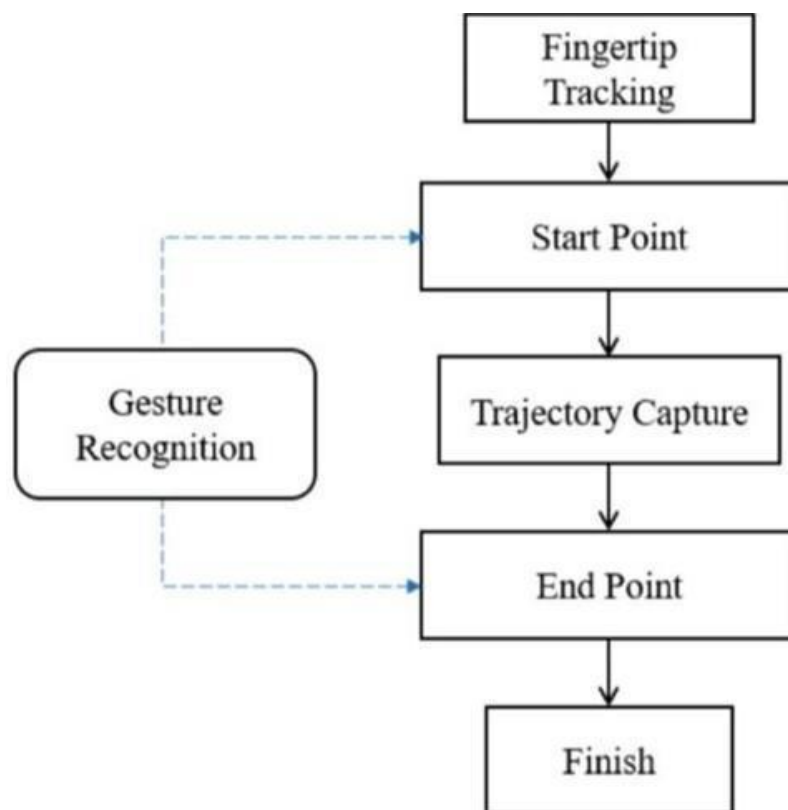

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Figure 1: Flowchart of Proposed System

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Hand Region Segmentation

So Firstly the hand tracking and segmentation which are the main or important steps for any kind of hand gesture recognition system in this. They are having the aim to develop or to organize the robust and make it hand segmentation algorithm, it also catches the hand using over procedure, division of the hand zone has been done by hiring a two step approach in this. The division of skin and subtraction of the starting point and having the best combined picture of the hand is created from the input of two. They offered a procedure which works effective in real-time and also gives a quite exact division. The fact that have a skin colors shift especially from kind to kind, it was observed

Figure 2: Hand region segmentation

that a skin color property is a short region between the typical skin sorts and although skin luminosity varies remarkably.

Subtraction of Background: The exact hand location with the Speedier R-CNN hand was a hold locator pulled by a string of skin tone the hu ma n h and's edg e, whi ch provi des a fairly wonderful division result. So the background was then removed in the next phase to clear the things that were skin-colored and weren't a finger or hand, including the box that leaps out of the acknowledging hand that should instant.

Localization of Hand Centroid

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So we are setting the center of gravity of a human hand which is exactly a basic that always taking after the steps, They are having framework two calculations to choose the starting The actual center of gravity is intended to be the more common of the two center

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of gravity estimates .Removing the change strategy. It is used to establish the initial estimation of the center of gravity .Having these points xc1, yc1. By doing distinct changes in an image, each of the pixel is talk it's discrete from the following edge pixel. to calculate the distance between a pixel and its nearest border pixel, Euclidean geometry was utilized.. So as a result, the center of gravity was shown as the pixel that had the greatest soar due to the clear shift in picture.

Figure 3: Localization of Hand Centroid

Using the contour's location, draw a line.

The practical motivation for in a Python deque, this computer vision is intended to outperform format. which is an information structure in this . The deque remembers the position of the diagram in each following outline, and we are going to use all collected focuses to form a line by using OpenCV drawing power. Firstly utilize the design layout position to decide whether to draw, create, or thumb a button on the provided or suitable sheet. There are a few buttons which are on this canvas's upper left. Whenever the arrow pointed at in this range, it was passed consenting to this given strategy which has shows in the given area.

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Figure 4: Drawing using position of the contour

5.DESIGNING AND IMPLEMENTATION OF VIRTUAL AI PAINTER

To guarantee this, the interface is very straightforward and easier to understand by the human.

Humans are capable of drawing in accordance with their choice what they actually want to draw without any problems or any type of difference.

In the future, it is really very useful for making the kids learn things and draw in schools in an interactive and appropriate way or it gives the clear vision to kids to explore it and get it easily and faster.

The frames are read, converted to the HSV color system, and made simple for color identification.
Construct the canvas frame and affix the appropriate link buttons to it.

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Now, set the print bar values to locate the colored marker mask..

The mask is preprocessed using phonological procedures like erosion and dilation.. The final or end point is to draw the points that have been stored in a given array on the frames and canvas.

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A variety of uses, including sending emails and messages, as the created text can also be utilized for these things.

An efficient way of communication that eliminates the necessity for writing and lowers the use of mobile devices and laptops.
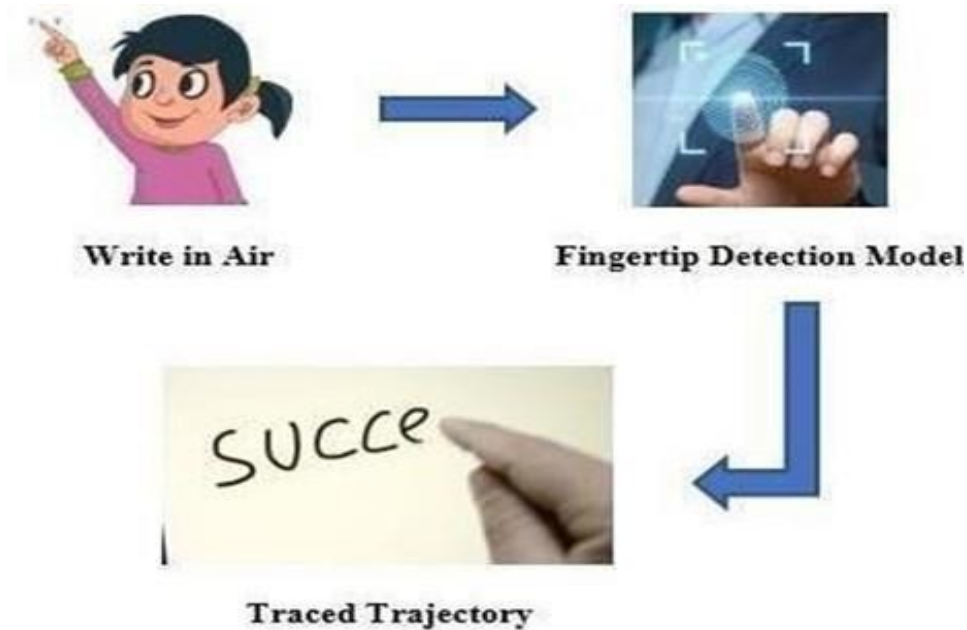

Figure 5: Workflow of the system

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The input image is converted by the algorithm code into HSV space, a very good colour system that is ideal for colour tracking.

Fingertip Detection Model:

Simply a stylus or You can write in the air with air-pens that have a distinctive color. The method, nevertheless, takes use of a fingertip. We think it should be possible for individuals to write without having to lift or carry anything around the stylus. Each frame's fingertip was identified using Deep Learning algorithms, which produced a set of coordinates.
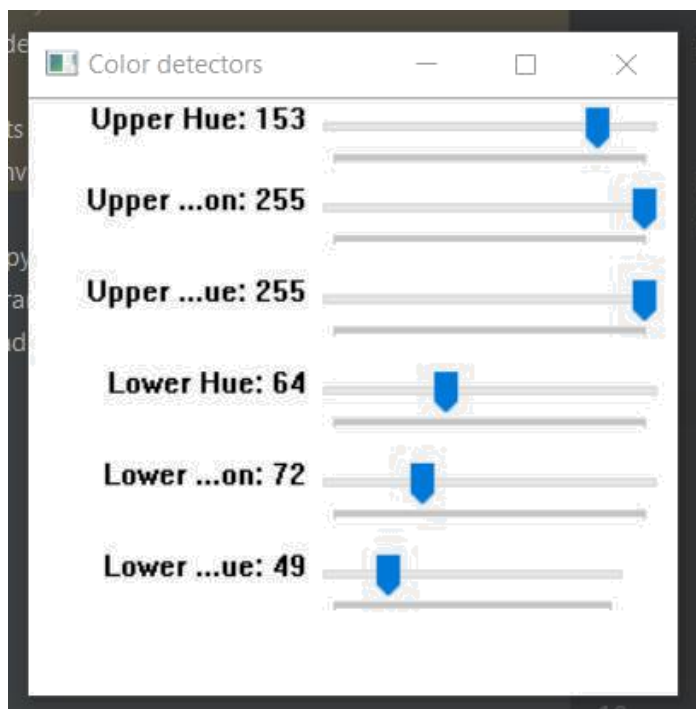
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Figure 6: Color Trackbar

Training for Fingertip Recognition Model

Dataset preparation and labelling were done, before being split into train and development sets (85%−15%). To train our dataset, we employed pre-trained Faster RCNN models and Single Shot Detector (SSD) models. Faster RCNN performed significantly more accurately in compared to SSD. For more details. The performance is accelerated since items are discovered in a single shot. It is usually used to detect objects instantly.An output feature map from Faster RCNN is used by Faster RCNN to compute region suggestions.

Implementation-

Initialize some items in Step 1

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We import the required libraries first. Follow the image shown in the picture.

LIBRARIES IN HANDTRACKING MODULE-
import cv2
import mediapipe as mp

import time

LIBRARIES IN VIRTUAL PAINTER-

import cv2

import numpy as np

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```
import time
import os
import HandTrackingModule as htm
```

Setting up the Paint Interface in Step 2

The coordinates of each color box on the frame have now been manually set. To draw the boxes, we employ the OpenCV method cv2.rectangle().

3. Start watching the video (Frame by Frame) The OpenCV function cv2 is now being used. Using a while loop and the VideoCapture() method, you can read a video in real-time from a camera or from a video file, frame by frame. In this instance, we supply 0 to the webcam read method. For simplicity of use, we may just implement the exact same paint interface.

Step 4: Locate the Interest Contour

Once we begin receiving the webcam feed, we utilize the cv2.inRange() method and the blue Upper and blue Lower variables we initialized in Step 0 to continuously scan the frames for an item of blue colour. After locating the contour, we smooth it using a number of image procedures. These activities are specialized morphing methods, as described below.

Step 1 - Initializations and imports

```
import cv2
```

```
import mediapipe as mp
cap = cv2.VideoCapture(0)
```

```
mpHands = mp.solutions.hands
hands = mpHands.Hands()
```

```
mpDraw = mp.solutions.drawing_utils
```

Step 2- utilizing both hands

```
if results.multi_hand_landmarks:

 for handLms in results.multi_hand_landmarks:
for id, lm in enumerate(handLms.landmark):

 h, w, c = image.shape
cx, cy = int(lm.x * w), int(lm.y * h)
```

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Step 3 - Adding hand connections and hand landmarks the hand picture

if id == 20 :
cv2.circle(image, (cx, cy), 25, (255, 0, 255), cv2.FILLED)

mpDraw.draw_landmarks(image, handLms, mpHands.HAND_CONNECTIONS)

Step 4 - showing the result

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cv2.imshow("Output", image)
cv2.waitKey(1)

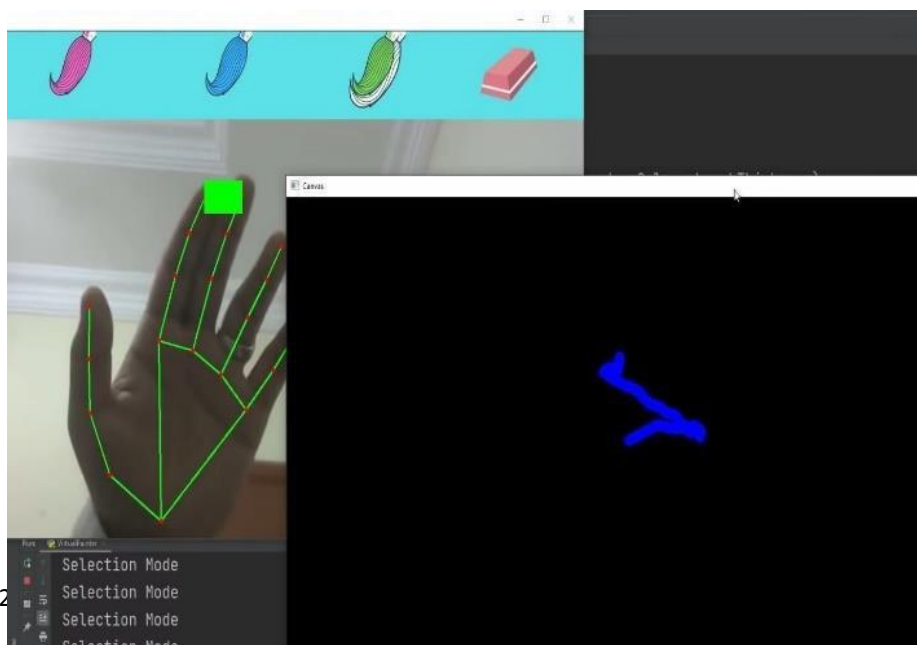## 6.EXPERIMENTAL RESULTS
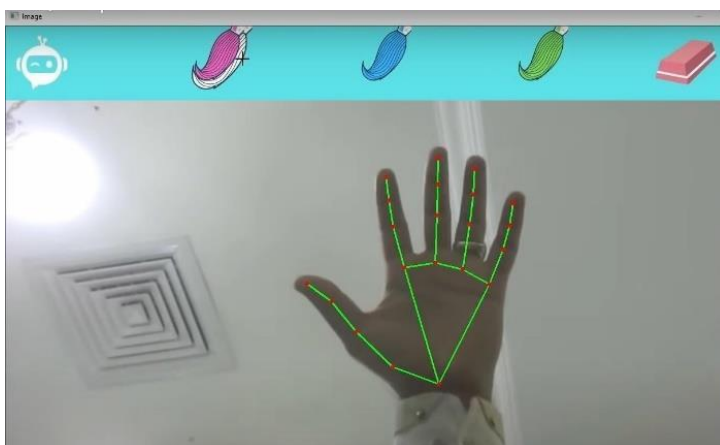
Figure 7.1

Figure 7.2

Figure 7: Output Screen

In this we holding the colored marker in the hand, we notice how the project has been carried out, and the four colors—blue, green, red, and yellow—are displayed in that order. and there is a clear button for erasing the illustration which is made by a human hand . Drawing or Sketching using your hands are the wish of everyone . We see writing with our hands in the air . So, now in this project the basic idea behind why we are here to make a canvas and choose colors that are required usingour left hand or use your right hand, sketch the desired image or write whatever on the whole screen as your choice.
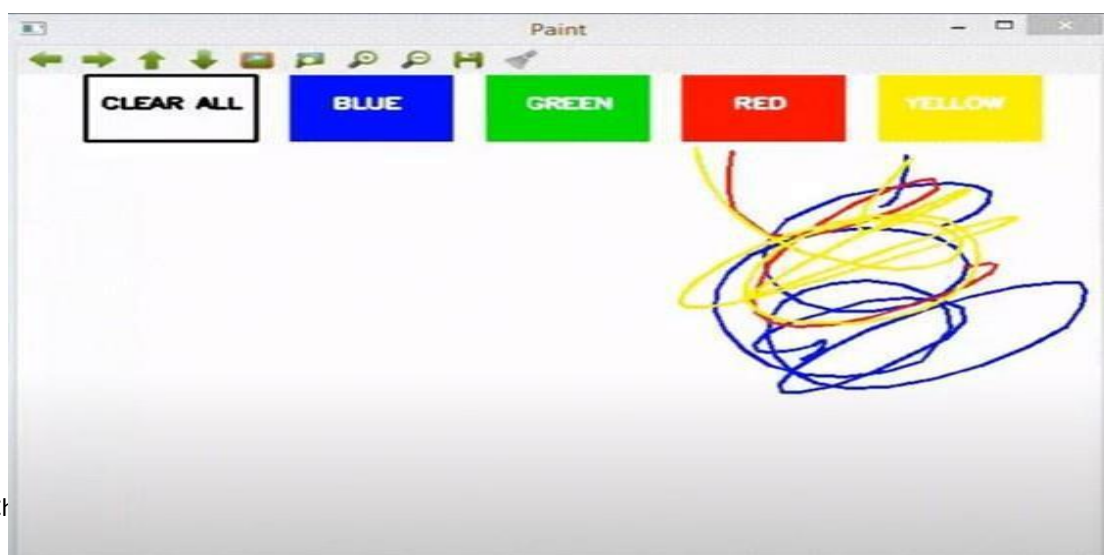
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Figure 8: Application GUI.

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7.CONCLUSION

This concept allows the individual to experience a unique and reciprocal world where they one might be able to sketch. according to their choice and also selecting the colors accordingly to them only which are shows on the screen and in this we select the virtual AI screen and painter is an application which is developed by using the library OpenCv and mediapipe and where we are also having more libraries and the different algorithm which are in built and also make there interface more active and effective.

In this project we also used python programming language which also have many libraries that are defined in that and this project can also be put to in many fields which never required lotsof experience in typing and it may also very structured as it took a little amount of time to send to the persons minds and we can make a space for the persons to draw anything whatever they actually wants by using with a single finger and there are the many colors of your choice and the different colors which are available and while using with the two fingers to make a choice in a very easily and uncomplicated manner.

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