**PYTHON IMPLEMENTATION**

**Code for Air Canvas**

import numpy as np

import cv2

from collections import deque

#default called trackbar function

def setValues(x):

print("")

# Creating the trackbars needed for adjusting the marker colour

cv2.namedWindow("Color detectors")

cv2.createTrackbar("Upper Hue", "Color detectors", 153, 180,setValues)

cv2.createTrackbar("Upper Saturation", "Color detectors", 255, 255,setValues)

cv2.createTrackbar("Upper Value", "Color detectors", 255, 255,setValues)

cv2.createTrackbar("Lower Hue", "Color detectors", 64, 180,setValues)

cv2.createTrackbar("Lower Saturation", "Color detectors", 72, 255,setValues)

cv2.createTrackbar("Lower Value", "Color detectors", 49, 255,setValues)

# Giving different arrays to handle colour points of different colour

bpoints = [deque(maxlen=1024)]

gpoints = [deque(maxlen=1024)]

rpoints = [deque(maxlen=1024)]

ypoints = [deque(maxlen=1024)]

# These indexes will be used to mark the points in particular arrays of specific colour

blue\_index = 0

green\_index = 0

red\_index = 0

yellow\_index = 0

#The kernel to be used for dilation purpose

kernel = np.ones((5,5),np.uint8)

colors = [(255, 0, 0), (0, 255, 0), (0, 0, 255), (0, 255, 255)]

colorIndex = 0

# Here is code for Canvas setup

paintWindow = np.zeros((471,636,3)) + 255

paintWindow = cv2.rectangle(paintWindow, (40,1), (140,65), (0,0,0), 2)

paintWindow = cv2.rectangle(paintWindow, (160,1), (255,65), colors[0], -1)

paintWindow = cv2.rectangle(paintWindow, (275,1), (370,65), colors[1], -1)

paintWindow = cv2.rectangle(paintWindow, (390,1), (485,65), colors[2], -1)

paintWindow = cv2.rectangle(paintWindow, (505,1), (600,65), colors[3], -1)

cv2.putText(paintWindow, "CLEAR", (49, 33), cv2.FONT\_HERSHEY\_SIMPLEX, 0.5, (0, 0, 0), 2, cv2.LINE\_AA)

cv2.putText(paintWindow, "BLUE", (185, 33), cv2.FONT\_HERSHEY\_SIMPLEX, 0.5, (255, 255, 255), 2, cv2.LINE\_AA)

cv2.putText(paintWindow, "GREEN", (298, 33), cv2.FONT\_HERSHEY\_SIMPLEX, 0.5, (255, 255, 255), 2, cv2.LINE\_AA)

cv2.putText(paintWindow, "RED", (420, 33), cv2.FONT\_HERSHEY\_SIMPLEX, 0.5, (255, 255, 255), 2, cv2.LINE\_AA)

cv2.putText(paintWindow, "YELLOW", (520, 33), cv2.FONT\_HERSHEY\_SIMPLEX, 0.5, (150,150,150), 2, cv2.LINE\_AA)

cv2.namedWindow('Paint', cv2.WINDOW\_AUTOSIZE)

# Loading the default webcam of PC.

cap = cv2.VideoCapture(0)

# Keep looping

while True:

# Reading the frame from the camera

ret, frame = cap.read()

#Flipping the frame to see same side of yours

frame = cv2.flip(frame, 1)

hsv = cv2.cvtColor(frame, cv2.COLOR\_BGR2HSV)

u\_hue = cv2.getTrackbarPos("Upper Hue", "Color detectors")

u\_saturation = cv2.getTrackbarPos("Upper Saturation", "Color detectors")

u\_value = cv2.getTrackbarPos("Upper Value", "Color detectors")

l\_hue = cv2.getTrackbarPos("Lower Hue", "Color detectors")

l\_saturation = cv2.getTrackbarPos("Lower Saturation", "Color detectors")

l\_value = cv2.getTrackbarPos("Lower Value", "Color detectors")

Upper\_hsv = np.array([u\_hue,u\_saturation,u\_value])

Lower\_hsv = np.array([l\_hue,l\_saturation,l\_value])

# Adding the colour buttons to the live frame for colour access

frame = cv2.rectangle(frame, (40,1), (140,65), (122,122,122), -1)

frame = cv2.rectangle(frame, (160,1), (255,65), colors[0], -1)

frame = cv2.rectangle(frame, (275,1), (370,65), colors[1], -1)

frame = cv2.rectangle(frame, (390,1), (485,65), colors[2], -1)

frame = cv2.rectangle(frame, (505,1), (600,65), colors[3], -1)

cv2.putText(frame, "CLEAR ALL", (49, 33), cv2.FONT\_HERSHEY\_SIMPLEX, 0.5, (255, 255, 255), 2, cv2.LINE\_AA)

cv2.putText(frame, "BLUE", (185, 33), cv2.FONT\_HERSHEY\_SIMPLEX, 0.5, (255, 255, 255), 2, cv2.LINE\_AA)

cv2.putText(frame, "GREEN", (298, 33), cv2.FONT\_HERSHEY\_SIMPLEX, 0.5, (255, 255, 255), 2, cv2.LINE\_AA)

cv2.putText(frame, "RED", (420, 33), cv2.FONT\_HERSHEY\_SIMPLEX, 0.5, (255, 255, 255), 2, cv2.LINE\_AA)

cv2.putText(frame, "YELLOW", (520, 33), cv2.FONT\_HERSHEY\_SIMPLEX, 0.5, (150,150,150), 2, cv2.LINE\_AA)

# Identifying the pointer by making its mask

Mask = cv2.inRange(hsv, Lower\_hsv, Upper\_hsv)

Mask = cv2.erode(Mask, kernel, iterations=1)

Mask = cv2.morphologyEx(Mask, cv2.MORPH\_OPEN, kernel)

Mask = cv2.dilate(Mask, kernel, iterations=1)

# Find contours for the pointer after idetifying it

cnts,\_ = cv2.findContours(Mask.copy(), cv2.RETR\_EXTERNAL,

cv2.CHAIN\_APPROX\_SIMPLE)

center = None

# Ifthe contours are formed

if len(cnts) > 0:

# sorting the contours to find biggest

cnt = sorted(cnts, key = cv2.contourArea, reverse = True)[0]

# Get the radius of the enclosing circle around the found contour

((x, y), radius) = cv2.minEnclosingCircle(cnt)

# Draw the circle around the contour

cv2.circle(frame, (int(x), int(y)), int(radius), (0, 255, 255), 2)

# Calculating the center of the detected contour

M = cv2.moments(cnt)

center = (int(M['m10'] / M['m00']), int(M['m01'] / M['m00']))

# Now checking if the user wants to click on any button above the screen

if center[1] <= 65:

if 40 <= center[0] <= 140: # Clear Button

bpoints = [deque(maxlen=512)]

gpoints = [deque(maxlen=512)]

rpoints = [deque(maxlen=512)]

ypoints = [deque(maxlen=512)]

blue\_index = 0

green\_index = 0

red\_index = 0

yellow\_index = 0

paintWindow[67:,:,:] = 255

elif 160 <= center[0] <= 255:

colorIndex = 0 # Blue

elif 275 <= center[0] <= 370:

colorIndex = 1 # Green

elif 390 <= center[0] <= 485:

colorIndex = 2 # Red

elif 505 <= center[0] <= 600:

colorIndex = 3 # Yellow

else :

if colorIndex == 0:

bpoints[blue\_index].appendleft(center)

elif colorIndex == 1:

gpoints[green\_index].appendleft(center)

elif colorIndex == 2:

rpoints[red\_index].appendleft(center)

elif colorIndex == 3:

ypoints[yellow\_index].appendleft(center)

# Append the next deques when nothing is detected to avois messing up

else:

bpoints.append(deque(maxlen=512))

blue\_index += 1

gpoints.append(deque(maxlen=512))

green\_index += 1

rpoints.append(deque(maxlen=512))

red\_index += 1

ypoints.append(deque(maxlen=512))

yellow\_index += 1

# Draw lines of all the colors on the canvas and frame

points = [bpoints, gpoints, rpoints, ypoints]

for i in range(len(points)):

for j in range(len(points[i])):

for k in range(1, len(points[i][j])):

if points[i][j][k - 1] is None or points[i][j][k] is None:

continue

cv2.line(frame, points[i][j][k - 1], points[i][j][k], colors[i], 2)

cv2.line(paintWindow, points[i][j][k - 1], points[i][j][k], colors[i], 2)

# Show all the windows

cv2.imshow("Tracking", frame)

cv2.imshow("Paint", paintWindow)

cv2.imshow("mask",Mask)

# If the 'q' key is pressed then stop the application

if cv2.waitKey(1) & 0xFF == ord("q"):

break

# Release the camera and all resources

cap.release()

cv2.destroyAllWindows()