**Task 3 Documentation**

**Aim:**

To Detect an object of particular shape and color using OpenCV and Python

**Software Used:**

* OpenCV
* Python v 3.8

**Introduction:**

***HSV Color Space***: Hue, Saturation, and Value (HSV) is a color model that is often used in place of the RGB color model in graphics and paint programs. In using this color model, a color is specified then white or black is added to easily make color adjustments. HSV may also be called HSB (short for hue, saturation and brightness).

***Object Detection***: We can detect shapes in real time in these three simple steps:

* Detect the objects, removing the background.
* Find the contours of the objects detected.
* Detect the shape of each of the objects detected, in real time.

**Procedure:**

**Step 1:**

* We start by importing the libraries OpenCV and Numpy, we create a function nothing that we need later and we load the camera.
* We import the libraries OpenCV and Numpy, then load the cap to get the frames from the webcam. After that we start a while Loop where we get the frames and we do the detection.
* We create the trackbars in order to change the ranges to detect a specific color in real time.
* Inside the while loop we define the HSV ranges (low, high), we create the mask and we show only the object with color of the trackbar.

**Step 2:**

* Second step once we detected the objects by their colors, we need to find the contours.
* We do this by using OpenCV findContours() methods and store the contours found

**Step 3:**

* If we consider a contour as a polygon which exactly surrounds the object, the shape detection is a simple counting of how many points the contour has.
* We need to remove as much noise as possible in order to have a clean contour. So, we use the approximation function of OpenCV
* Later we improve even more the detection, removing all the small dots detected, which are just noise. We do that by taking contour which have a big area, in this case greater than 400 pixels.
* And finally, we can count the no of points the contour has so as to find out which type of shape the contour has.

**Future Improvements:**

* Display the shape of the object on the screen
* Auto detection of shape and its colors

**Bibliography:**

* Programming Knowledge YouTube Channel
* PySource YouTube Channel
* <https://docs.opencv.org/master/d9/df8/tutorial_root.html> (OpenCV Documentation)

**Project By:**

Pratik Kumar Panda