

Contours:

Contours are, in simple, curves joining all the continuous points (along the boundary), having same color or intensity. The contours are a useful tool for shape analysis and object detection and recognition. For better accuracy, use binary images. So before finding contours, apply threshold or canny edge detection. FindContours function provided by the opencv library modifies the source image. So if you want source image even after finding contours, store it to some other variables. The following line of code illustrates the use of the findContours function provided by the opencv library.

```
Output_image, contours, hierarchy = cv2.findContours(INPUT_IMAGE,  
                                                    cv2.RETR_TREE,  
                                                    cv2.CHAIN_APPROX_SIMPLE)
```

There are three arguments in cv2.findContours() function, first one is source image, second is contour retrieval mode, third is contour approximation method. And it outputs the image, contours and hierarchy. Contours is a Python list of all the contours in the image. Each individual contour is a Numpy array of (x,y) coordinates of boundary points of the object.

Drawing contours:

The list of contours returned by the function contains all the contours identified in the image by the function. The contours are labeled with 0 based indices. All contours can be drawn or a specific contour can be drawn based on the requirement.

To draw all the contours in an image:

```
image = cv2.drawContours(image, contours, -1, (0,255,0), 3)
```

To draw an individual contour, say 4th contour:

```
image = cv2.drawContours(image, contours, 3, (0,255,0), 3)
```

Contour Approximation Method:

This is the third argument in cv2.findContours function. As contours are the boundaries of a shape with same intensity, it stores the (x,y) coordinates of the boundary of a shape. But does it store all the coordinates ? That is specified by this contour approximation method.

If `cv2.CHAIN_APPROX_NONE` is passed, all the boundary points are stored. But actually do we need all the points? For egg, if contour is a straight line, then we do not need all the points on the line to represent that line. We need just two end points of that line. This is what `cv2.CHAIN_APPROX_SIMPLE` does. It removes all redundant points and compresses the contour, thereby saving memory.