Shape Detection:

Localizing and outlining geometric shapes in an image using image processing is called shape detection.

To detect shapes using OpenCV we followed following steps:

1. Convert the 3-channel RGB image to 1-channel grayscale image.

OPTIONAL STEP: Threshold (Binarize) the grayscale image.

2. Apply canny edge detection on the grayscale image to find edges.

3. Find contours (curve of points with no gaps in the curve) for the edges.

4. The contours represent the shapes, drawing them on the original image would outline the shapes.

Shape Recognition

Identifying and annotating geometric shapes in an image using image processing is called shape recognition.

To recognize geometric shapes in an image using OpenCV we followed following steps:

1. Convert the 3-channel RGB image to 1-channel grayscale image.

OPTIONAL STEP: Threshold (Binarize) the grayscale image.

2. Apply canny edge detection on the grayscale image to find edges.

3. Find contours (curve of points with no gaps in the curve) for the edges.

4. Apply contour approximation or Ramer Douglas Peucker algorithm on each contour to reduce points in a contour to a minimum. This algorithm removes any redundant points in contour. Remaining points represent the vertices of curves.

5. We will check number of vertices to identify shapes:

i. If number of vertices is 3 then it's a triangle.

ii. If number of vertices is 4 then it can either be a rectangle or a square.

We will calculate the width/height (aspect ratio).

If aspect ratio is close to 1 then it’s a square else, it’s a rectangle.

iii. If number of vertices is greater than 10 or so then it must be a circle.

6. After Identifying the shapes we use OpenCV method to display shape names at their respective centroids.

Object Detection

Finding instances of real-world objects such as faces, bicycles, and buildings in images is called object detection. Object detection algorithms typically use extracted features and learning algorithms to recognize instances of an object category.

Popular methods to for object detections are:

1. Deep learning object detections

2. Feature based object detection

3. Viola-Jones object detection

4. SVM classification with histograms of oriented gradients (HOG) features