Canny Edge Detection and Harris Point Detection

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1 Canny Edge Detection

1.1 Algorithm

1. Read an image and convert it into gray scale.
2. Apply Gaussian blur with filter size [5 5] and sigma 1.4 to reduce the noise in the imae because Canny Edge Detection is sensitive to noise.
3. Find gradient magnitude and direction using Sobel method.
4. Normalize the gradient magnitude in the range of [0 255].
5. Apply non maximum suppression.
6. Apply thresholding and hysterisys on suppressed image.
7. Mean squared error and Peak-signal-to-noise ratio is calculated by considering 3x3 non-overlapping sections of output image and reference images respectively.

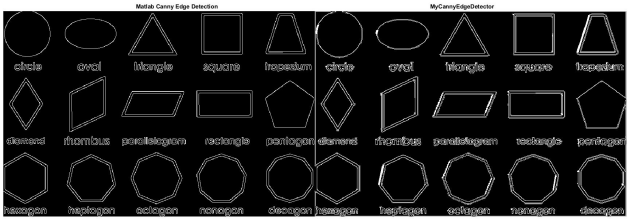

Figure 3: Comparison of Canny Edge Detector present in Matlab and MyCannyEdgeDetector with threshold [50 100]

1.2 Observation

1. MSE and PSNR are similar to the image.
2. MSE sort of smoothens the image but we lose the fine edges.

1.3 Image Source

Google Images

1.4 Results

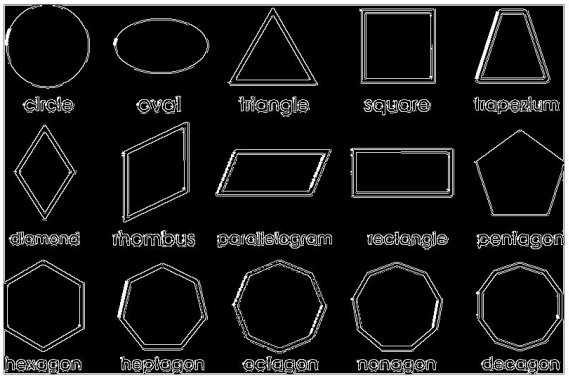

Figure 1: Output of MyCannyEdgeDetector with threshold [50 100]

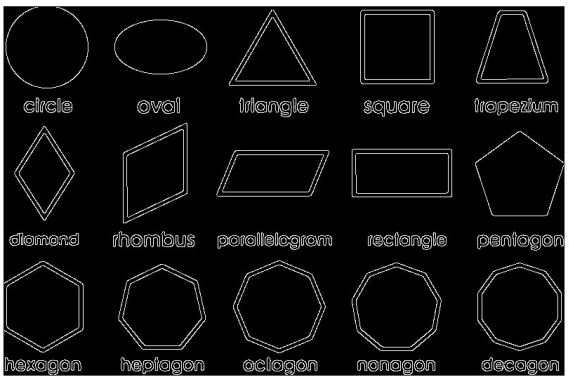

Figure 2: Canny Edge Detector present in Matlab threshold [50 100]

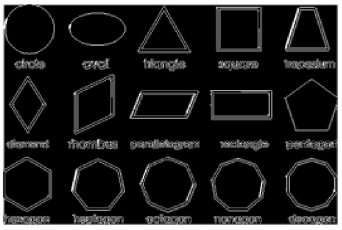

Figure 4: Mean Squared Error represented as image

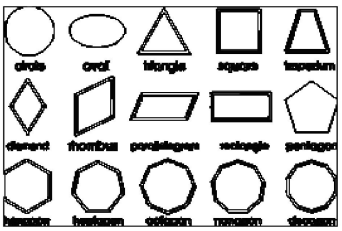

Figure 5: Peak-Signal-To-Noise ratio represented as image

2 Harris Point Detection

2.1 Algorithm

1. Apply MyCannyEdgeDetector to get the edges.
2. Find horizontal and vertical gradients in the image.
3. Apply Gaussian blur with filter size 5x5 and sigma 1.4 on the output gradients.
4. Set the mask weight (W(x,y)) to 1.
5. Set the threshold (k) to 0.04.
6. Find the matrix (M) using Harris formula.
7. Find the value (R) which corresponds to E(u,v) in the Harris formula.
8. If this value (R) is above the threshold (here set as 10000), then consider the pixel.
9. Apply suppression on 3x3 neighbourhood and select the pixels which are greater than all the 8 of its neighbours.

2.2 Image Source

Google Images

2.3 Results

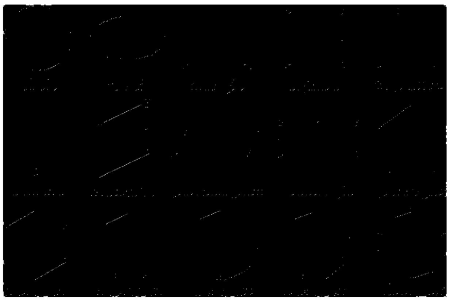

Figure 6: Harris Point Detection on MyCannyEdgeDetector output]

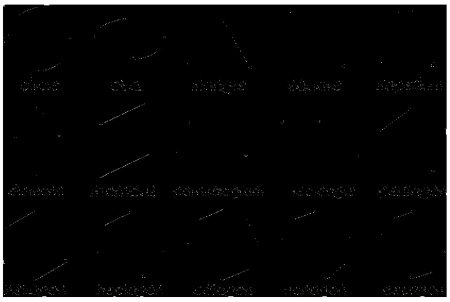

Figure 7: Harris Point Detection on original image]