

## Assignment 2

### Canny Edge Detection

MSEE-18005  
JUNAID MAQBOOL

#### 1. Generating Mask:

In this task a function is implemented to determine the size of filter and then generating the Gaussian derivative filter.

- Size of Mask depends on Threshold “T” to clip the Gaussian and standard deviation “sigma” .
- Greater the size of the filter thicker the edges are obtained in the image.
- Filters with different sizes and sigmas are tried.
- A method is implemented for 2d convolution with zero padding.

```
1 Gy,Gx=Generte_Masks(sigma=1.5,T=0.2)

1 Gx

array([[ 0.,  1.,  1., -0., -1., -1., -0.],
       [ 1.,  3.,  3., -0., -3., -3., -1.],
       [ 3.,  5.,  5., -0., -5., -5., -3.],
       [ 3.,  7.,  6., -0., -6., -7., -3.],
       [ 3.,  5.,  5., -0., -5., -5., -3.],
       [ 1.,  3.,  3., -0., -3., -3., -1.],
       [ 0.,  1.,  1., -0., -1., -1., -0.]])
```

#### 2. Compute gradient magnitude and direction:

- A method is implemented to convolve the image with Gaussian derivatives and obtaining fx and fy.
- Then Magnitude is obtained from fx and fy.
- A function is written for rounding off angles to four directions.

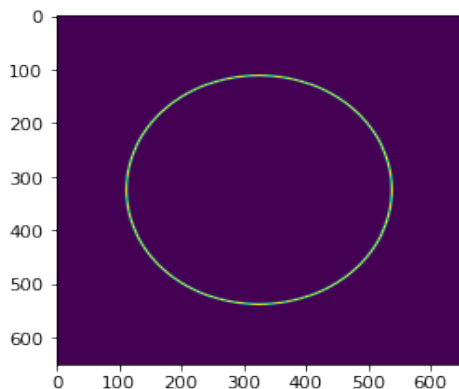


Illustration 2: Magnitude of gradient

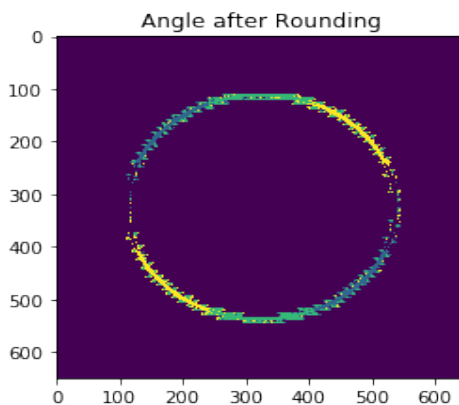
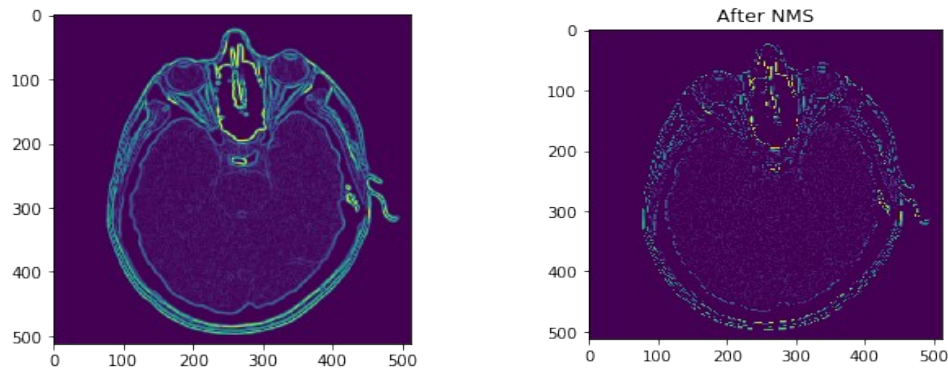


Illustration 1: Angle of gradient after rotating

### 3. Non-Maxima Suppression:

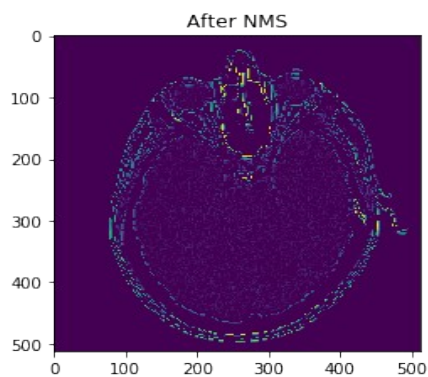
Non-Maximum suppression is implemented to thin the edges which otherwise are thick.

In non maximum suppression due to the angles in the only four directions effect of this discretization can be seen in Non- Maximum Suppression.

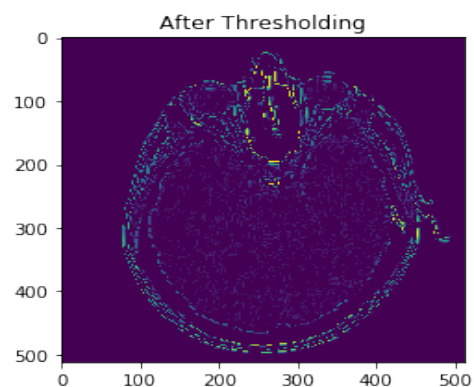


### 4. Hysteresis Thresholding:

- A recursive function which finds recursively the pixels having value above TI around the pixels having values above TH and make their values equal to TH.
- Thresholding extends the edges and make the many faint edges more clear for exploring further details in image.



*Illustration 3: Before Hysteresis*



*Illustration 4: After Hysteresis*