2/10/2015

HW2 ELEC345

1. PAPER OF CANNY EDGE DETECTION

In the paper the author set up three performance criteria: good detection, good localization, only one response to a single edge. An optimal step edge function is introduced, and further discussion leads to an approximation of the optimal step edge operator by first derivation of a Gaussian. Then hysteresis thresholding is applied to an image to get the edge detection more accurate. Then use non-maximum suppression to find the local maxima and mark it as edge. Edges of different scales can also be identified using Gaussian with different σ. Using directional edge mask will also enhance the performance of edge detection.

2. IMPLEMENTATION

A. Noise Reduction

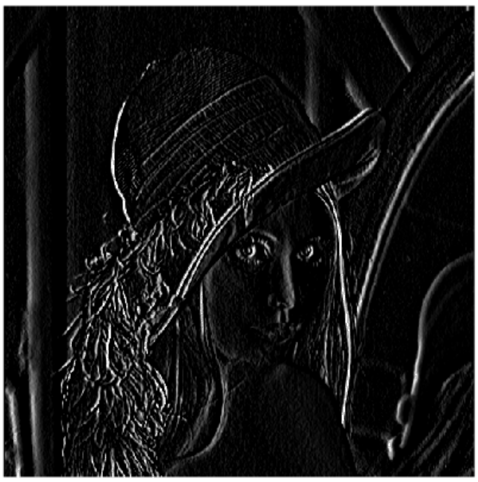
Using the noise reduction matrix as matrix to filter the greyscale image.

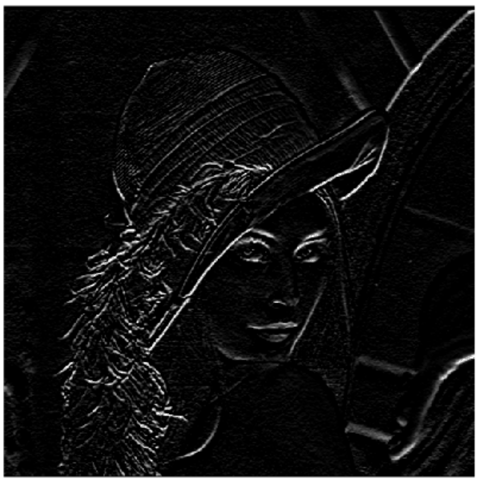
B. Gradient Magnitude and Angle

Prolems encountered: never use uint8 to store data, use double and when showing the figure, convert to uint8.

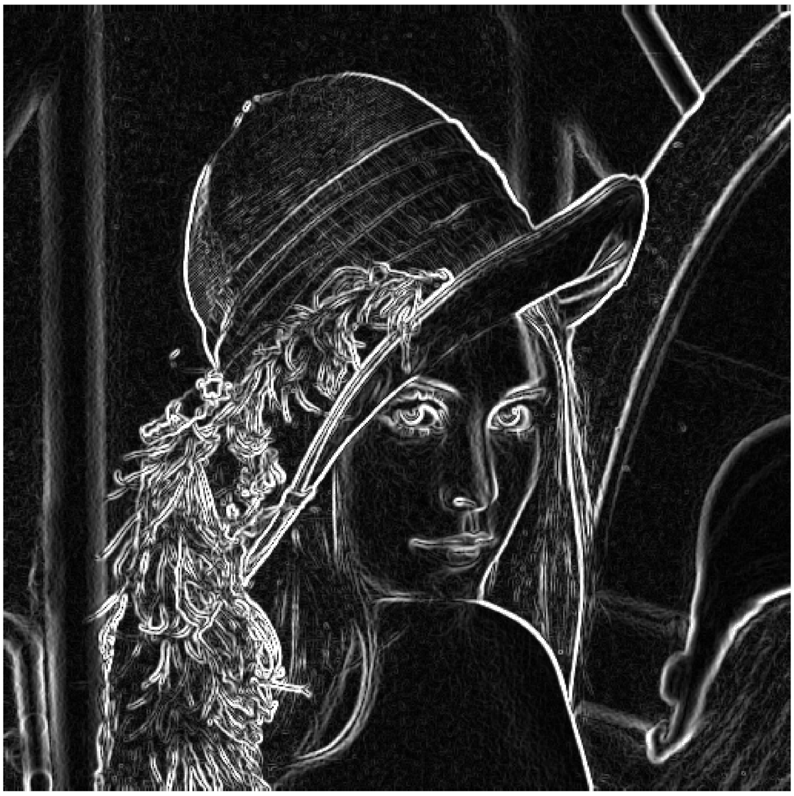
Using the derivative filter on the smoothed image (converted to double already)

Dx and Dy:





Magnitude:



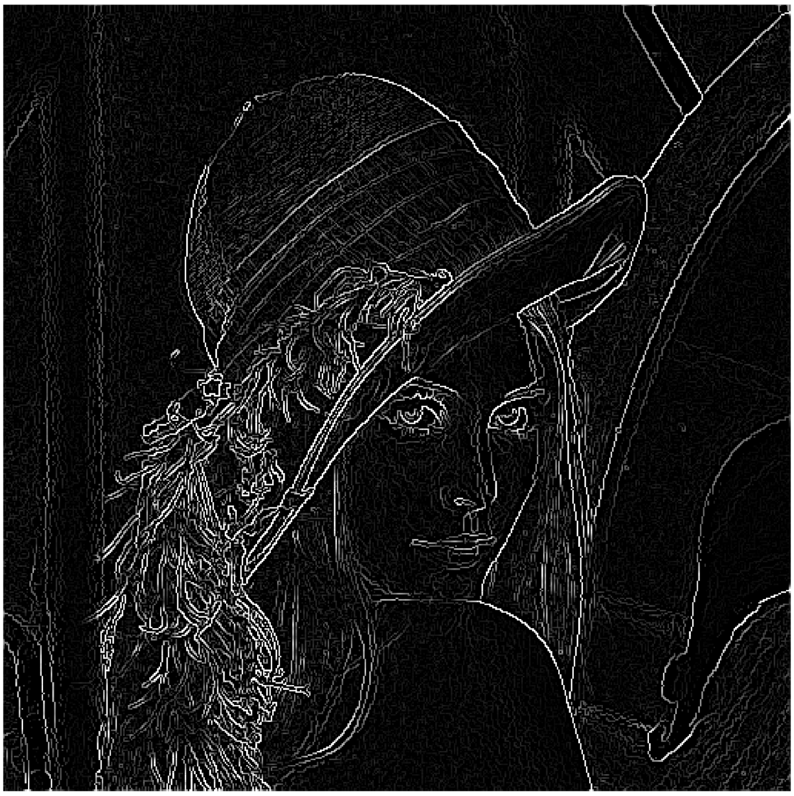
Angles and round up:

```
baseTheta360 = baseTheta/2/pi*360;
baseThetaR180 = (1-floor((baseTheta360+180)/180))
*180+baseTheta360;
```

C. Non-Maximum Suppression

The i, j of the matrix index is not x, y. The angles is a little subtle.

(x+1,y+1) is actually (i-1,j+1).

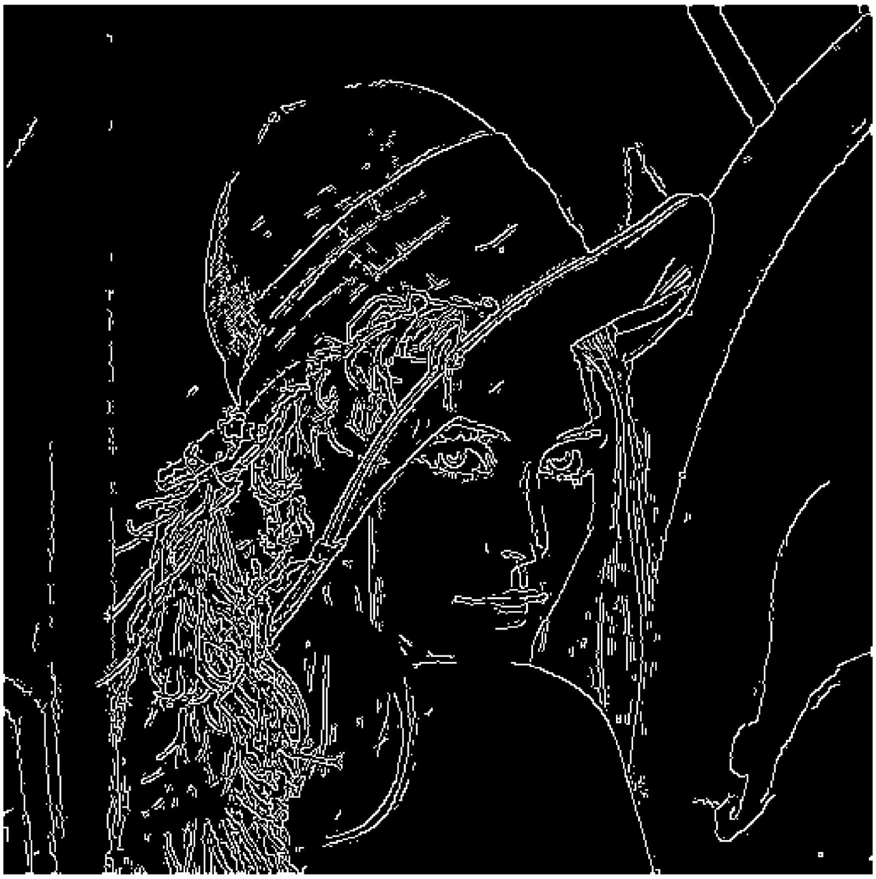


D. Hysteresis Thresholding

I think there is better ways to do hysteresis thresholding to actually follow linesto get a better Canny edge pictures, but that would also be harder to implement.

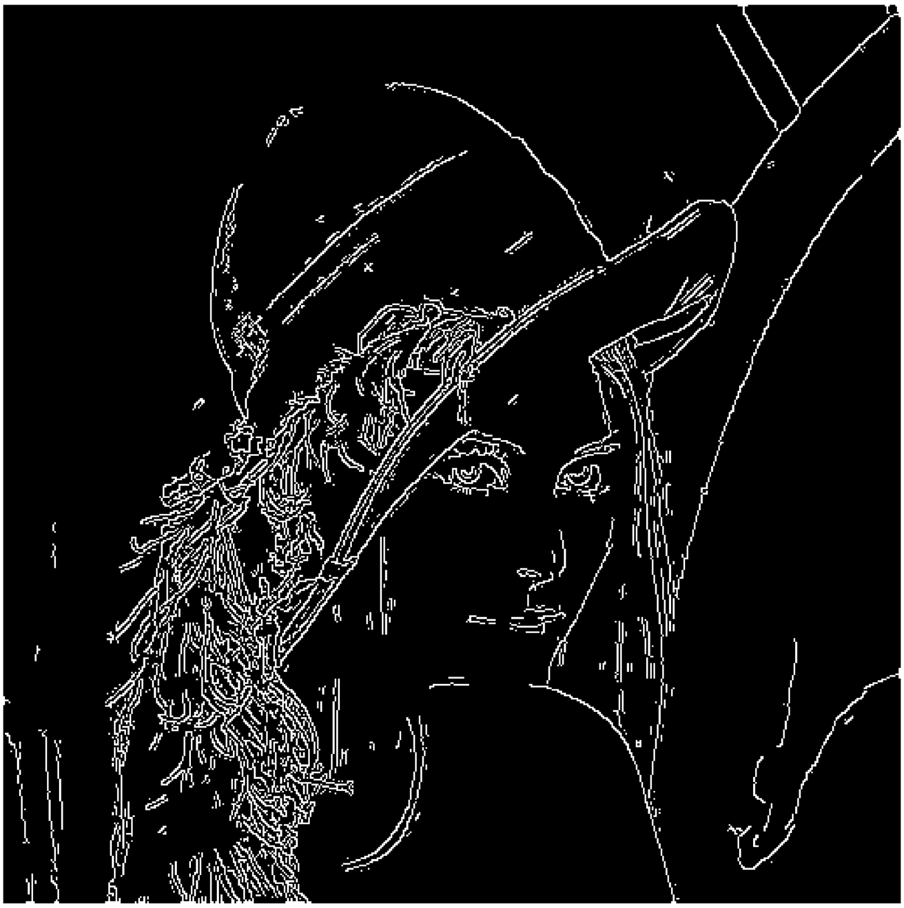
T_{high} = 0.15*MaxIntensity

T_{low} = 0.5*Thigh



T_{high} = 0.2*MaxIntensity

T_{low} = 0.4*Thigh



3. SUMMARY

The implementation is pretty straight forward. The homework instructions is very helpful.