Assignment 1 Report
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In this assignment I perform different experiments using canny edge detection.Below I have shared many experiments with different parameters of sigma on different images to find out edges.

Experiment 1:

Total Dataset Image: 1
Resultant images : 13
Row size : 120
Column size 120:
Sigma size: 0.5,1,2
Character : Boy

Image 1:

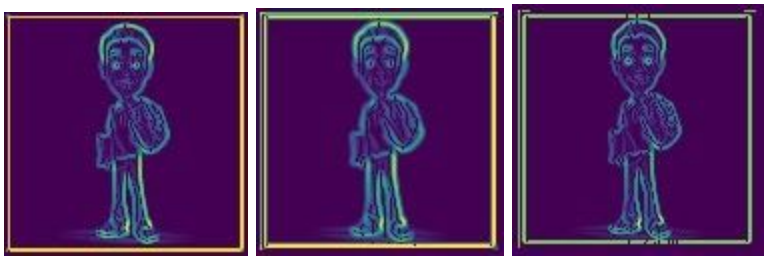
1-Apply Gaussian G(x,y):
Sigma:0.5 , 1 and 2

2-Apply Fx:
Sigma 0.5, 1 and 2

3-Apply Fy
Sigma 0.5, 1 and 2

4-Apply Gradient Magnitude
Sigma 0.5 1 and 2

5-Apply NMS(Non Maxima Suppression)
Sigma 0.5, 1 and 2



6-Apply Hysteresis Thresholding:
Sigma 0.5(TH=200,TL=100) , 1(TH=200,TL=100) , 1(TH=230,TL=150) and 2(TH=230,TL=150)

7-Final Result (Sigma 0.5,1,2)

Experiment 2:

Total Dataset Image: 1
Resultant images : 13
Row size : 120
Column size 120:
Sigma size: 0.5,1,2
Character : Lion
Image 2:

1-Apply Gaussian G(x,y):

Sigma:0.5 , 1 and 2

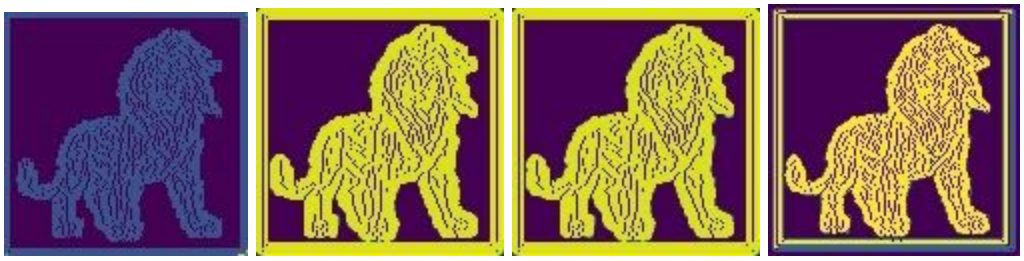
2-Apply Fx:
Sigma 0.5, 1 and 2

3-Apply Fy:
Sigma 0.5, 1 and 2

4-Apply Gradient Magnitude
Sigma 0.5 1 and 2

5-Apply NMS(Non Maxima Suppression)
Sigma 0.5, 1 and 2

6-Apply Hysteresis Thresholding:
Sigma 0.5(TH=230,TL=150) , 1(TH=200,TL=100) , 1(TH=230,TL=150) and 2(TH=200,TL=100)



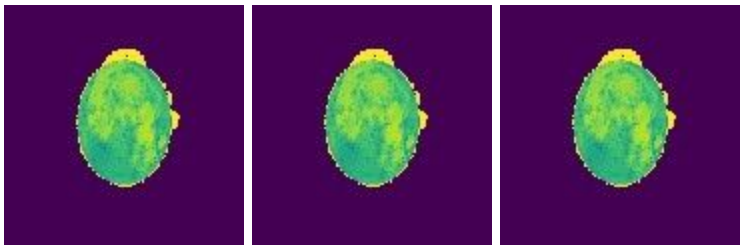
7-Final Result(Sigma 0.5,1,2)

Experiment 3:

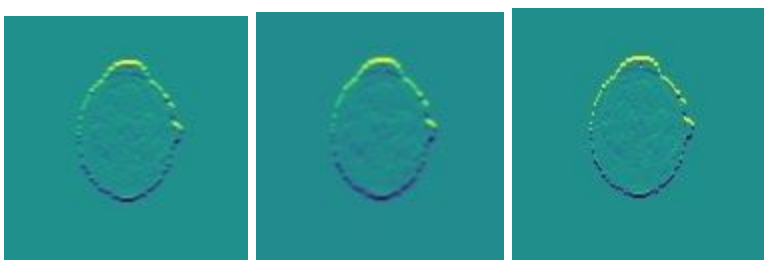
Total Dataset Image: 1
Resultant images : 13
Row size : 120
Column size 120:
Sigma size: 0.5,1,2
Character : Moon

Image 3:

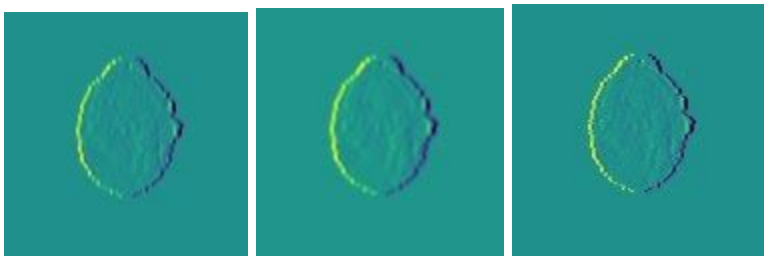
1-Apply Gaussian G(x,y):
Sigma:0.5 , 1 and 2



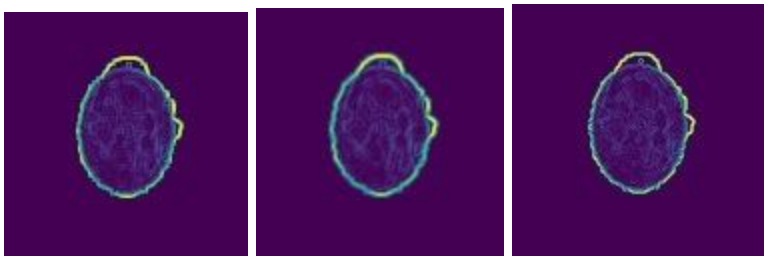
2-Apply Fx:
Sigma 0.5, 1 and 2



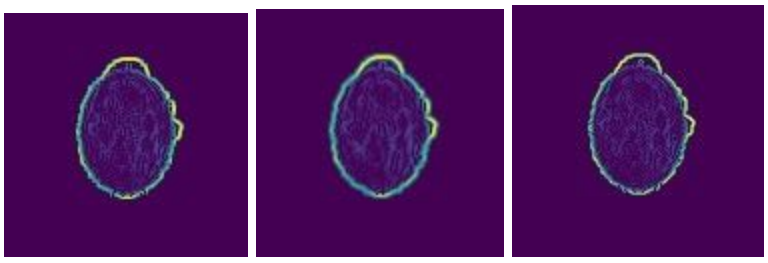
3-Apply Fy:
Sigma 0.5, 1 and 2



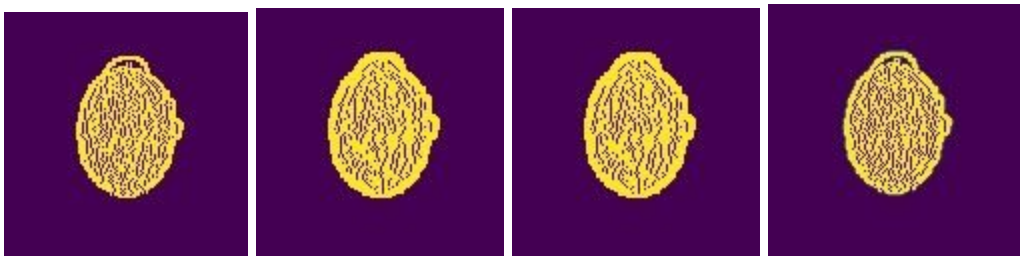
4-Apply Gradient Magnitude
Sigma 0.5 1 and 2



5-Apply NMS(Non Maxima Suppression)
Sigma 0.5, 1 and 2



6-Apply Hysteresis Thresholding:
Sigma 0.5(TH=200,TL=100) , 1(TH=200,TL=100) , 1(TH=230,TL=150) and 2(TH=230,TL=150)

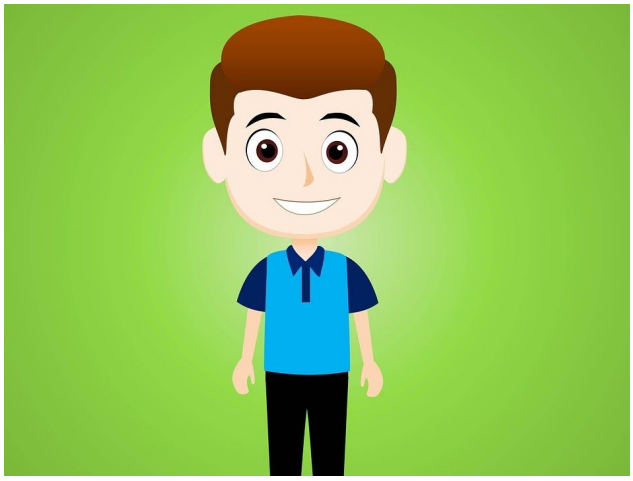


7-Final Result(sigma 0.5,1,2)

Experiment 4:

Total Dataset Image: 1
Resultant images : 13
Row size : 120
Column size 120:
Sigma size: 0.5,1,2
Character : Student

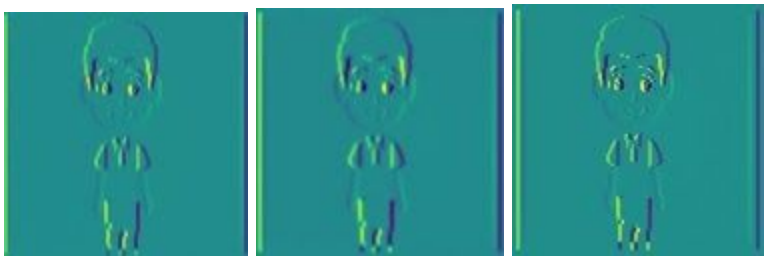
Image 4:



1-Apply Gaussian G(x,y):
Sigma:0.5 , 1 and 2

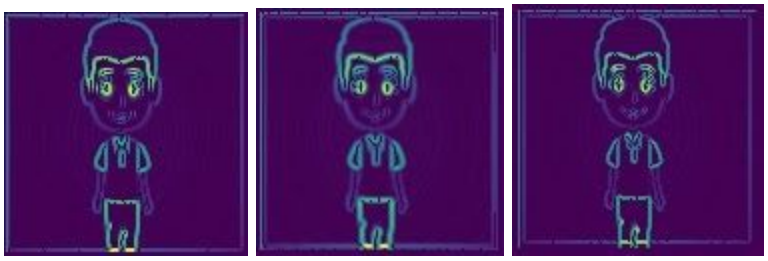
2-Apply Fx:
Sigma 0.5, 1 and 2

3-Apply Fy:
Sigma 0.5, 1 and 2



4-Apply Gradient Magnitude
Sigma 0.5 1 and 2

5-Apply NMS(Non Maxima Suppression)
Sigma 0.5, 1 and 2

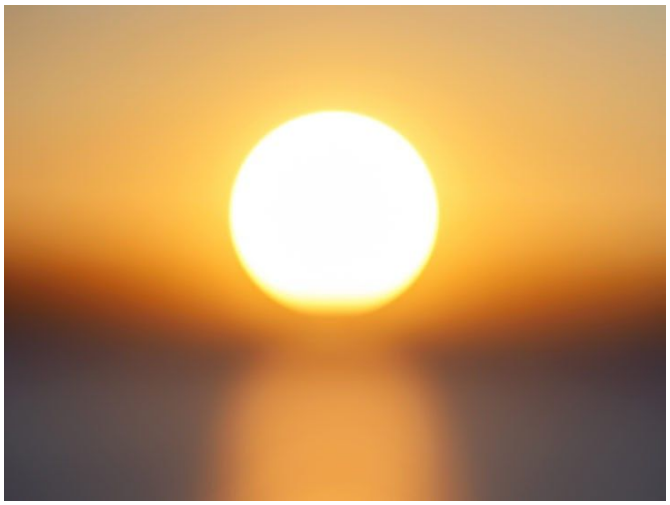


6-Apply Hysteresis Thresholding:
Sigma 0.5(TH=250,TL=150) , 1(TH=200,TL=150) , 1(TH=230,TL=180) and 2(TH=200,TL=150)

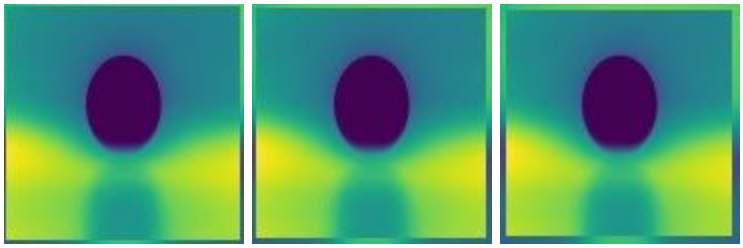
Result (sigma 0.5,1 and 2)

Experiment 5:

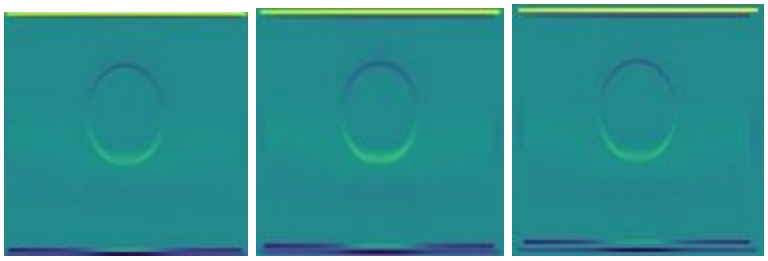
Total Dataset Image: 1
Resultant images : 13
Row size : 120
Column size 120:
Sigma size: 0.5,1,2
Character : Sun
Image 5:



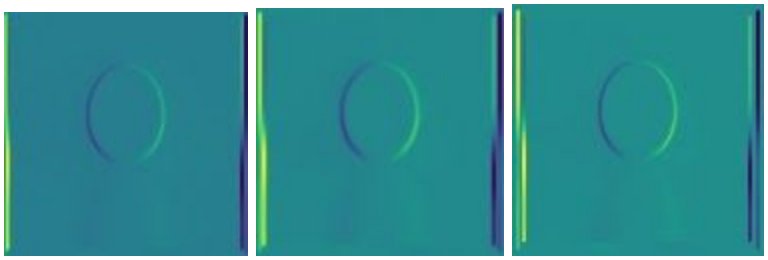
1-Apply Gaussian G(x,y):
Sigma:0.5 , 1 and 2



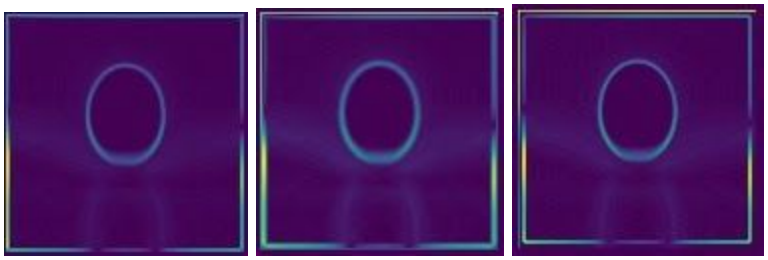
2-Apply Fx:
Sigma 0.5, 1 and 2



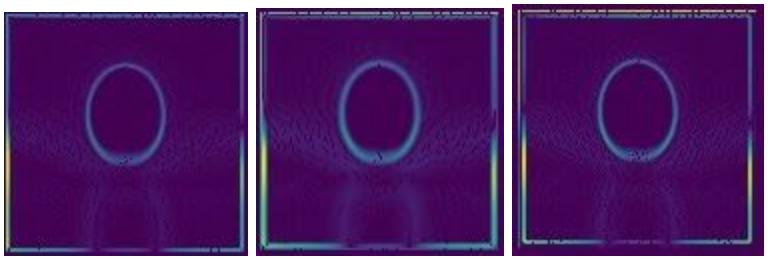
3-Apply Fy:
Sigma 0.5, 1 and 2



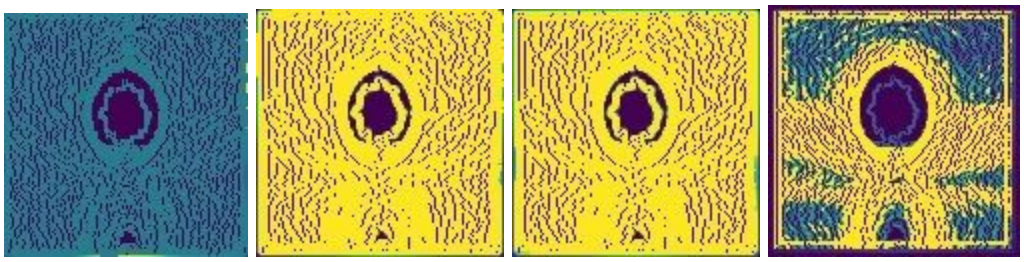
4-Apply Gradient Magnitude
Sigma 0.5 1 and 2



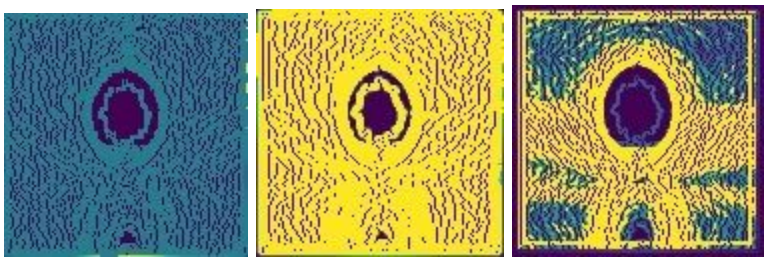
5-Apply NMS(Non Maxima Suppression)
Sigma 0.5, 1 and 2



6-Apply Hysteresis Thresholding:
Sigma 0.5(TH=230,TL=150) , 1(TH=200,TL=100) , 1(TH=230,TL=150) and 2(TH=200,TL=100)



7-Result (Sigma 0.5,1,2)



Analysis:

As we can see in gaussian images i remove high frequency components from grayscale images and make images smooth and set sigma that is showing spread of image.
For sigma 0.5 it will generate a mask of size 3x3 for sigma 1 it will generate a mask of 5x5 and for sigma 2 it will generate a mask of 9x9. When we increase the size of sigma it will start blurring edges.so recommended size of sigmais 0.5 and 1.
In Derivative of gaussian with respect to x and y is used to detect vertical and horizontal edges you can see above in image. When i take derivatives with respect to x you can see direction of edges are vertical and when i take derivative with respect to y you can see direction of edges are horizontal.it means that edges are perpendicular to gradient vectors that will enhance edges.After that we want to thin more edges then we will move towards NMS that we used to remove all points along gradient direction that are not maximum you can see above that i reduce edges to make more thin.Finally after applying NMS i move towards hysteresis thresholding in which i compare with high and low value of threshold and make edges more clear. If we increase the size of threshold it will detect less edges and when we will decrease size of threshold it will detect more edges but sometimes noise can also be occurred.So we should set the average size for TH and TL to detect edges.