



BLG 477E

MULTIMEDIA COMPUTING

CRN: 22539

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ASSIGNMENT #1

Canny Edge Detector

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A. Introduction

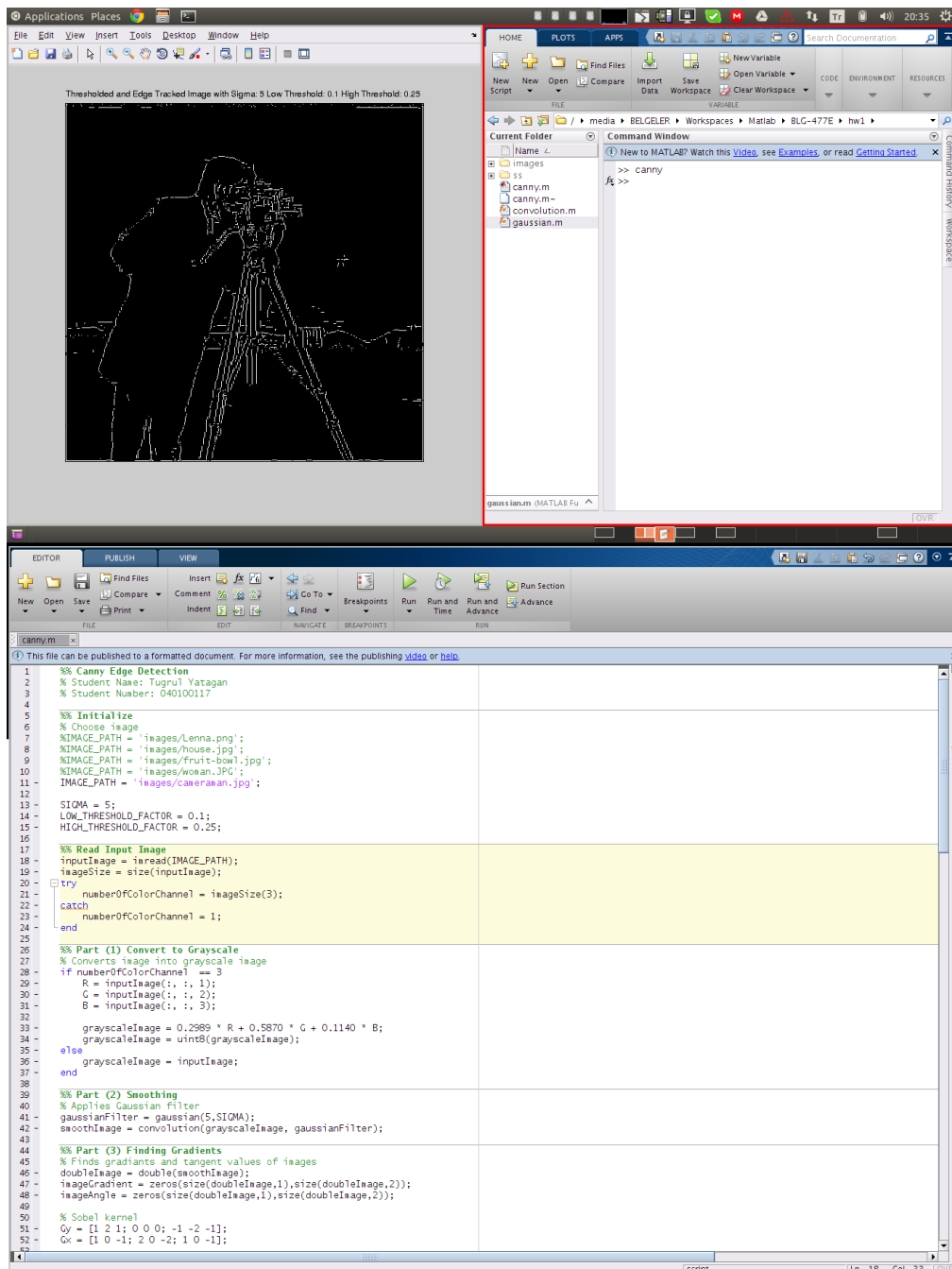
In this project Canny Edge Detector algorithm is implemented with MATLAB. Algorithm has six stages;

1. Convert to Grayscale
2. Smoothing
3. Finding gradients
4. Non-maximum suppression
5. Double thresholding
6. Edge tracking by hysteresis

These steps are done in `canny.m` source file consecutively with MATLAB. There are two auxiliary functions in source file for Gaussian filter calculation and convolution.

B. Development and Operating Environments

MATLAB R2012b has been used on Ubuntu 14.04 operation system.



C. Analysis of Canny Algorithm Stages

Canny Edge Detector algorithm stages analysis will be done with Lena image. All images are taken from MATLAB canny.m application with different stages.

1. Grayscale

RGB to grayscale image is below.



2. Smoothing

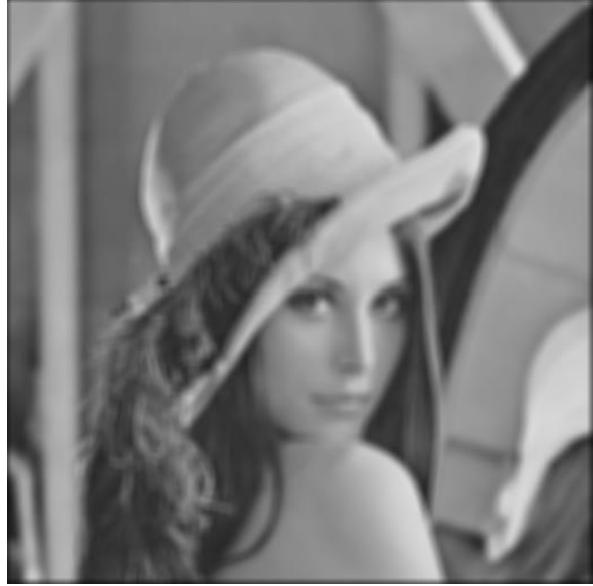
Gaussian filtering images with different Gaussian sigma values are below. Blurring increases when sigma increase.



Smooth Image with Sigma: 5



Smooth Image with Sigma Value: 15



3. Finding Gradients

Total magnitude of X and Y gradients image with Gaussian sigma value 1 is below.

Gradient Magnitude



4. Non-Maximum suppression

Non-Maximum suppression image of magnitude gradient image with Gaussian sigma value 1 is below.

Non-Maximum Suppressed Image



5. Double Thresholding and Edge Tracking by Hysteresis

Thresholded and edge tracked images with different Gaussian sigma, low threshold and high threshold values are below. Default Gaussian sigma value is 1 unless otherwise is stated. Low and high threshold values are relative to the image. Low and high threshold values are multiplied with maximum pixel value of images after non-maximum suppression.

Gaussian sigma value: 1, low threshold value: 0.1

Thresholded and Edge Tracked Image with Low Threshold Value: 0.1 High Threshold Value: 0.15



Thresholded and Edge Tracked Image with Low Threshold Value: 0.1 High Threshold Value: 0.2



Thresholded and Edge Tracked Image with Low Threshold Value: 0.1 High Threshold Value: 0.3



Thresholded and Edge Tracked Image with Low Threshold Value: 0.1 High Threshold Value: 0.6



Gaussian sigma value: 1, low threshold value: 0.2

Thresholded and Edge Tracked Image with Low Threshold Value: 0.2 High Threshold Value: 0.3



Thresholded and Edge Tracked Image with Low Threshold Value: 0.2 High Threshold Value: 0.35



Thresholded and Edge Tracked Image with Low Threshold Value: 0.2 High Threshold Value: 0.4



Thresholded and Edge Tracked Image with Low Threshold Value: 0.2 High Threshold Value: 0.5



Gaussian sigma value: 1, low threshold value: 0.25, high threshold value: 0.3

Thresholded and Edge Tracked Image with Low Threshold Value: 0.25 High Threshold Value: 0.3



Gaussian sigma value: 1, low threshold value: 0.3, high threshold value: 0.5

Thresholded and Edge Tracked Image with Low Threshold Value: 0.3 High Threshold Value: 0.5



Gaussian sigma value: 2, low threshold value: 0.2, high threshold value: 0.25

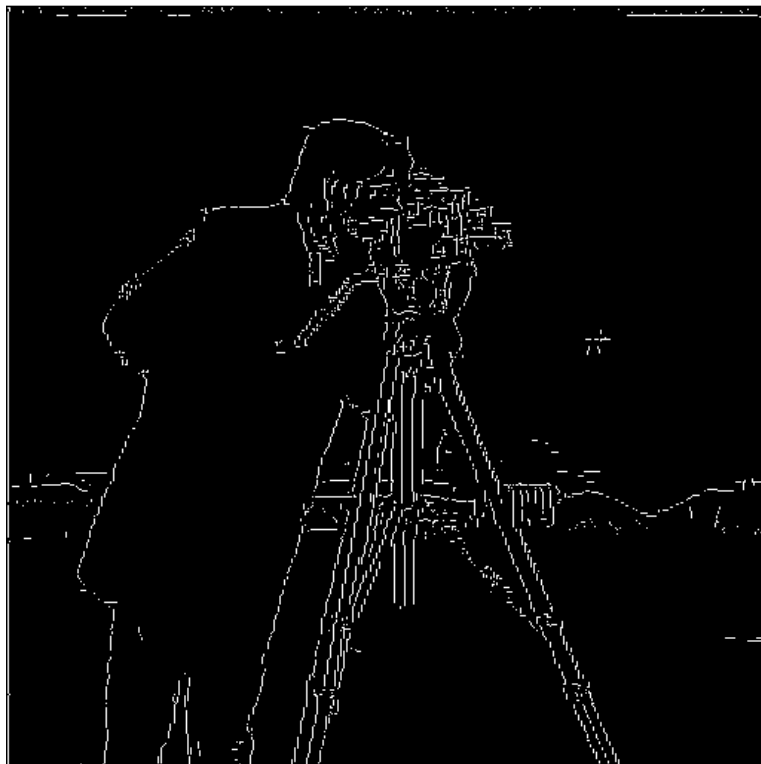
Thresholded and Edge Tracked Image with Sigma: 2 Low Threshold: 0.2 High Threshold: 0.25



D. Final Results of Other Images

Camerman; Gaussian sigma value: 5, low threshold value: 0.1, high threshold value: 0.25

Thresholded and Edge Tracked Image with Sigma: 5 Low Threshold: 0.1 High Threshold: 0.25



Fruit bowl; Gaussian sigma value: 1, low threshold value: 0.2, high threshold value: 0.3

Thresholded and Edge Tracked Image with Sigma: 1 Low Threshold: 0.2 High Threshold: 0.3



House; Gaussian sigma value: 1, low threshold value: 0.1, high threshold value: 0.25

Thresholded and Edge Tracked Image with Sigma: 1 Low Threshold: 0.2 High Threshold: 0.3



Woman; Gaussian sigma value: 2, low threshold value: 0.2, high threshold value: 0.3

Thresholded and Edge Tracked Image with Sigma: 2 Low Threshold: 0.2 High Threshold: 0.3

