**Computer Vision - 217**

**Homework 1**

**Chen Naveh**

**Elad Wasserstein**

**Answers for questions:**

**Section A:**

* No questions in this section to answer

**Section B:**

**Question B** - Why choosing this image

FINISHE HERE!!!

**Question E:** How different parameters (sigma, L\_th, H\_th) affect the results?

FINISHE HERE!!!

**Section C:**

**Question F:**

1. Which choice of Canny's parameters will cause P to be high?

If we choose L\_th, H\_th and sigma to be high we will get higher values of P since most of the detected values are true edges. We also need to take into consideration that high params will also detecte edges which are not edges.

1. Which choice of Canny's parameters will cause R to be high?

If we choose L\_th, H\_th and sigma to be low than we will get almost all pixesls that are relevant for true edges and many other pixels.

1. Why do we need the F measure as well?

Since the P measurement helps understand how many selected items are relevant and R helps us understand how many relevant items were selected, the combination of the two may help us better evaluate the algorithm. The F-measure is a way to measure how well our detector works

**Question G:**

P,R, F results for Nuns.jpg file

|  |  |  |
| --- | --- | --- |
| **P** | **R** | **F** |
| 0.003503 | 0.305355 | 0.006925955 |
| 9.80E-09 | 0.106177 | 1.96E-08 |
| 6.09E-11 | 0.061162 | 1.22E-10 |
| 0.000859 | 0.046462 | 0.00168771 |
| 4.03E-09 | 0.032447 | 8.05E-09 |
| 2.95E-11 | 0.023688 | 5.89E-11 |
| 0.000673 | 0.027039 | 0.001313105 |
| 2.67E-09 | 0.016757 | 5.35E-09 |
| 2.41E-11 | 0.015843 | 4.83E-11 |
| 0.003503 | 0.305355 | 0.006925955 |
| 9.80E-09 | 0.106177 | 1.96E-08 |
| 6.09E-11 | 0.061162 | 1.22E-10 |
| 0.00085 | 0.045929 | 0.001669784 |
| 4.03E-09 | 0.032447 | 8.05E-09 |
| 2.95E-11 | 0.023688 | 5.89E-11 |
| 0.000671 | 0.026963 | 0.001310235 |
| 2.67E-09 | 0.016757 | 5.35E-09 |
| 2.41E-11 | 0.015843 | 4.83E-11 |
| 0.003503 | 0.305355 | 0.006925955 |
| 9.80E-09 | 0.106177 | 1.96E-08 |
| 6.09E-11 | 0.061162 | 1.22E-10 |
| 0.000808 | 0.041968 | 0.001584945 |
| 3.97E-09 | 0.031762 | 7.94E-09 |
| 2.89E-11 | 0.023079 | 5.77E-11 |
| 0.000654 | 0.026049 | 0.001275341 |
| 2.67E-09 | 0.016757 | 5.35E-09 |
| 2.41E-11 | 0.015843 | 4.83E-11 |

P,R, F results for Church.jpg file

|  |  |  |
| --- | --- | --- |
| **P** | **R** | **F** |
| 0.002384807 | 0.340326 | 0.004736425 |
| 1.07E-08 | 0.201079 | 2.15E-08 |
| 5.70E-11 | 0.098292 | 1.14E-10 |
| 0.001982576 | 0.232245 | 0.003931589 |
| 9.70E-09 | 0.164519 | 1.94E-08 |
| 5.19E-11 | 0.08181 | 1.04E-10 |
| 0.001854504 | 0.183898 | 0.003671978 |
| 9.84E-09 | 0.124763 | 1.97E-08 |
| 5.28E-11 | 0.064129 | 1.06E-10 |
| 0.002384807 | 0.340326 | 0.004736425 |
| 1.07E-08 | 0.201079 | 2.15E-08 |
| 5.70E-11 | 0.098292 | 1.14E-10 |
| 0.001976883 | 0.231445 | 0.00392028 |
| 9.70E-09 | 0.164519 | 1.94E-08 |
| 5.19E-11 | 0.08181 | 1.04E-10 |
| 0.001849221 | 0.183298 | 0.003661502 |
| 9.84E-09 | 0.124763 | 1.97E-08 |
| 5.28E-11 | 0.064129 | 1.06E-10 |
| 0.002384807 | 0.340326 | 0.004736425 |
| 1.07E-08 | 0.201079 | 2.15E-08 |
| 5.70E-11 | 0.098292 | 1.14E-10 |
| 0.001922266 | 0.221956 | 0.003811522 |
| 9.68E-09 | 0.16362 | 1.94E-08 |
| 5.18E-11 | 0.08141 | 1.04E-10 |
| 0.001833434 | 0.180501 | 0.003629996 |
| 9.84E-09 | 0.124763 | 1.97E-08 |
| 5.28E-11 | 0.064129 | 1.06E-10 |

P,R, F results for Golf.jpg file

|  |  |  |
| --- | --- | --- |
| **P** | **R** | **F** |
| 0.003853523 | 0.36233598 | 0.007625942 |
| 1.44E-08 | 0.134932703 | 2.89E-08 |
| 9.80E-11 | 0.087908994 | 1.96E-10 |
| 0.000720425 | 0.036999493 | 0.001413332 |
| 3.22E-09 | 0.02128738 | 6.44E-09 |
| 2.55E-11 | 0.018358957 | 5.11E-11 |
| 0.000469483 | 0.018358957 | 0.000915553 |
| 2.18E-09 | 0.011770006 | 4.36E-09 |
| 1.50E-11 | 0.008672636 | 3.00E-11 |
| 0.003853523 | 0.36233598 | 0.007625942 |
| 1.44E-08 | 0.134932703 | 2.89E-08 |
| 9.80E-11 | 0.087908994 | 1.96E-10 |
| 0.000706365 | 0.036211072 | 0.001385699 |
| 3.22E-09 | 0.02128738 | 6.44E-09 |
| 2.55E-11 | 0.018358957 | 5.11E-11 |
| 0.000460138 | 0.017964746 | 0.000897294 |
| 2.18E-09 | 0.011770006 | 4.36E-09 |
| 1.50E-11 | 0.008672636 | 3.00E-11 |
| 0.003853523 | 0.36233598 | 0.007625942 |
| 1.44E-08 | 0.134932703 | 2.89E-08 |
| 9.80E-11 | 0.087908994 | 1.96E-10 |
| 0.000631395 | 0.030354227 | 0.001237058 |
| 3.15E-09 | 0.020555274 | 6.31E-09 |
| 2.52E-11 | 0.018021062 | 5.04E-11 |
| 0.000449702 | 0.017288956 | 0.000876603 |
| 2.18E-09 | 0.011770006 | 4.36E-09 |
| 1.50E-11 | 0.008672636 | 3.00E-11 |

**Question I:**

Are the result (P,R,F) remain the same? (when using imdilate)

* The result P, R, F didn’’t remain the same
* The best set of parameters remained the same
* When applying imdilate, we receive higher results. However, it did not influence the end results since everything is changed relatively

**Section D:**

**Question K:**

where SOBEL fails while Canny edge detector succeeds:

The results of sobel edge detector bring broken edges and fat edges while canny edge detector is a little bit smarter. i.e. canny edge detector can clean noise better (say by using gaussian filter) and by using non-maximum suppression bring better results in detect thin edges

**Question L:**

P,R, F results for Nuns.jpg file

|  |  |  |
| --- | --- | --- |
| P | R | F |
| 0.091743 | 0.067027 | 0.077461 |
| 0.089979 | 0.022774 | 0.036348 |
| 0.021077 | 0.000686 | 0.001328 |

P,R, F results for Church.jpg file

|  |  |  |
| --- | --- | --- |
| P | R | F |
| 0.33724 | 0.39087 | 0.36208 |
| 0.424867 | 0.191489 | 0.263995 |
| 0.064516 | 0.003996 | 0.007525 |

P,R, F results for Golf.jpg file

|  |  |  |
| --- | --- | --- |
| P | R | F |
| 0.104293 | 0.046517 | 0.064338 |
| 0.094935 | 0.016782 | 0.028522 |
| 0.085549 | 0.004167 | 0.007948 |

**Question M:**

Which edge detector gives the highest 𝐹 measure? Give a short discussion of where in the image they give different results:

……NEED TO finish here……

**Documentation of the function**

**Section A:**

….....

**Section B:**

**Section C:**

* Evaluate Naïve:
  + Function sign:
    - [P,R,F]=evaluate\_naive(E,E\_GT)
  + Input params:
    - E - the set E of pixels detected as edges
    - E\_GT - the ground truth (GT) set of pixels selected manually
      * The input matrixes must have the same dimensionality
  + Output params:
    - The values of P, R and F based on the input
  + The function is located in the file evaluate\_naive.m
* Evaluate:
  + Function sign:
    - [P,R,F]=evaluate (E,E\_GT)
  + Input params:
    - E - the set E of pixels detected as edges
    - E\_GT - the ground truth (GT) set of pixels selected manually
      * The input matrixes must have the same dimensionality
  + Output params:
    - The values of P, R and F based on E and E\_GT(after applying imdilate)
  + The function is located in the file evaluate.m
* Sobel:
  + Function sign:
    - [output] = sobel(file\_name,th)
  + Input params:
    - File\_name – path to picture to run sobel edge detector on
    - th – threshold for the sobel edge detector algorithm
  + Output params:
    - 2d matrix that return 1 where it detected edges and zero otherwise
  + The function is in the file sobel.m