Homework 1

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**Answers for questions:**

**Section A:**

**Section B:**

**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, however there is also a lot of them that are not detected but those don’t influence the P measurement by definition of P

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 also many other pixels but again those don’t influence the R measurement by definition of R

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 we need to combine those measurement. 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 should not influence the params so much 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 more smarter. i.e. canny edge detector has the ability to clean nois in the image using gaussian filter and 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:**

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**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 located in the file sobel.m