Computer Vision | Assignment 1

Submitted by,

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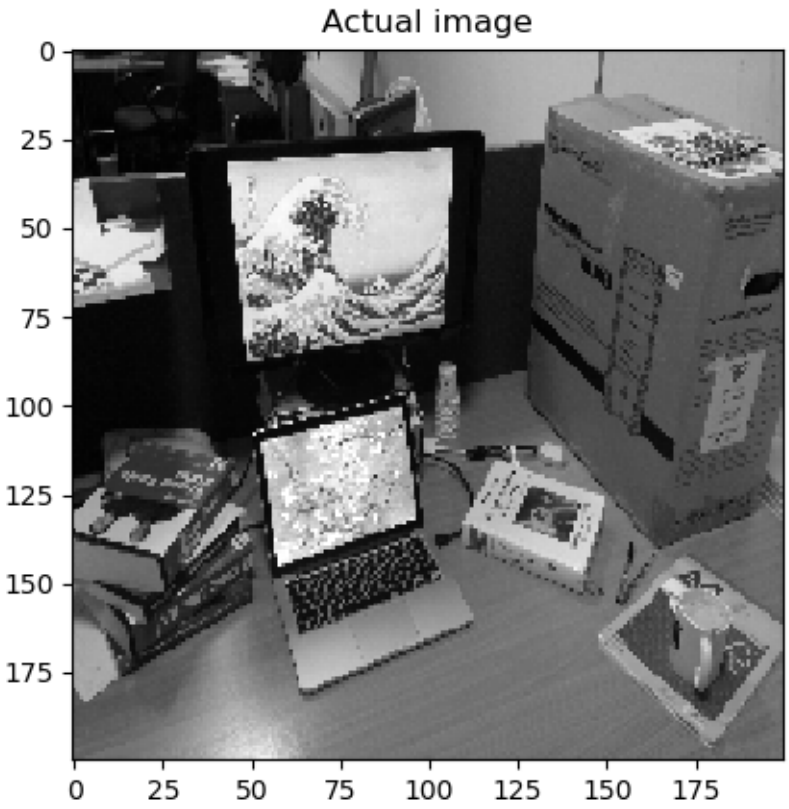


The above image in grayscale is for all the codes below (sample.jpg in same directory resized to 200x200 within the program).

Q1).

a)

Gaussian filter with standard deviation 1

```
[[1.791e-08 5.931e-07 7.226e-06 3.238e-05 5.339e-05 3.238e-05 7.226e-06  5.931e-07 1.791e-08]
 [5.931e-07 1.964e-05 2.393e-04 1.072e-03 1.768e-03 1.072e-03 2.393e-04  1.964e-05 5.931e-07]
 [7.226e-06 2.393e-04 2.915e-03 1.306e-02 2.154e-02 1.306e-02 2.915e-03  2.393e-04 7.226e-06]
 [3.238e-05 1.072e-03 1.306e-02 5.855e-02 9.653e-02 5.855e-02 1.306e-02  1.072e-03 3.238e-05]
 [5.339e-05 1.768e-03 2.154e-02 9.653e-02 1.592e-01 9.653e-02 2.154e-02  1.768e-03 5.339e-05]
 [3.238e-05 1.072e-03 1.306e-02 5.855e-02 9.653e-02 5.855e-02 1.306e-02  1.072e-03 3.238e-05]
 [7.226e-06 2.393e-04 2.915e-03 1.306e-02 2.154e-02 1.306e-02 2.915e-03  2.393e-04 7.226e-06]
 [5.931e-07 1.964e-05 2.393e-04 1.072e-03 1.768e-03 1.072e-03 2.393e-04  1.964e-05 5.931e-07]
 [1.791e-08 5.931e-07 7.226e-06 3.238e-05 5.339e-05 3.238e-05 7.226e-06  5.931e-07 1.791e-08]]
```

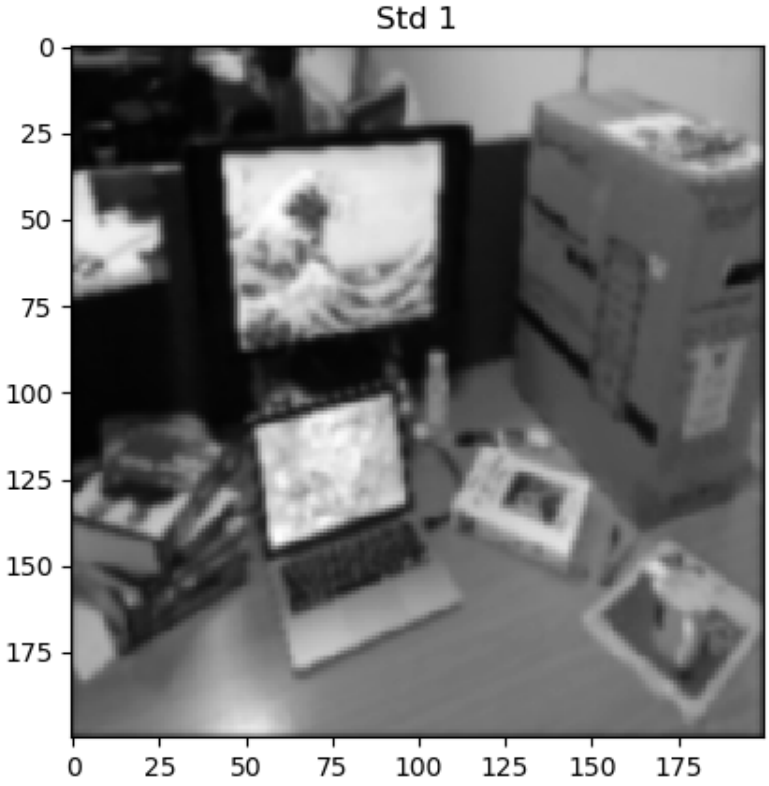
Gaussian filter with standard deviation 3

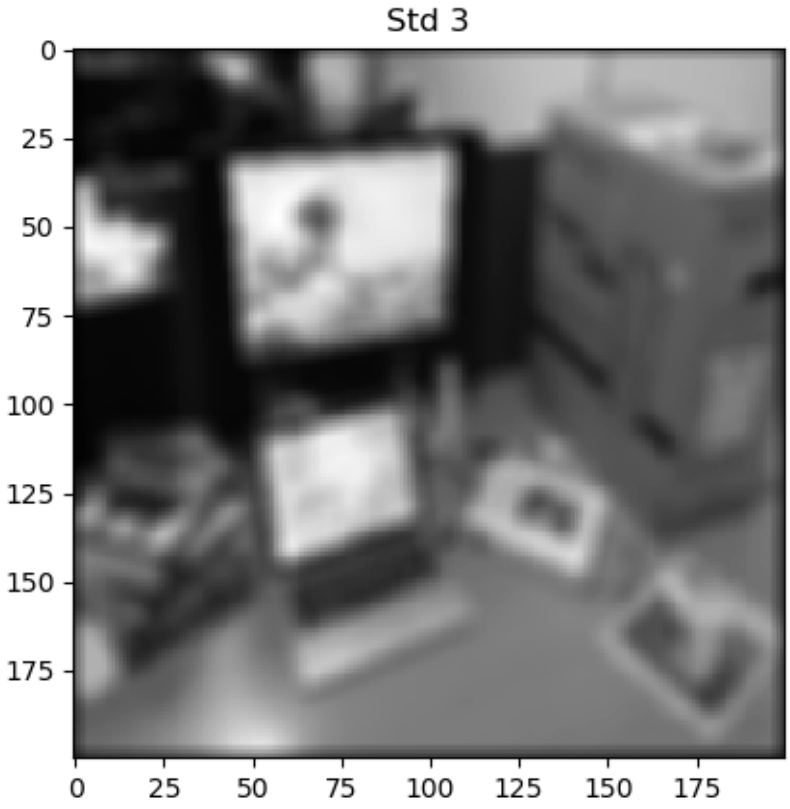
```
[[0.004 0.006 0.008 0.009 0.01  0.009 0.008 0.006 0.004]
 [0.006 0.009 0.011 0.013 0.014 0.013 0.011 0.009 0.006]
 [0.008 0.011 0.015 0.018 0.019 0.018 0.015 0.011 0.008]
 [0.009 0.013 0.018 0.021 0.022 0.021 0.018 0.013 0.009]
 [0.01  0.014 0.019 0.022 0.023 0.022 0.019 0.014 0.01 ]
 [0.009 0.013 0.018 0.021 0.022 0.021 0.018 0.013 0.009]
 [0.008 0.011 0.015 0.018 0.019 0.018 0.015 0.011 0.008]
 [0.006 0.009 0.011 0.013 0.014 0.013 0.011 0.009 0.006]
 [0.004 0.006 0.008 0.009 0.01  0.009 0.008 0.006 0.004]]
```

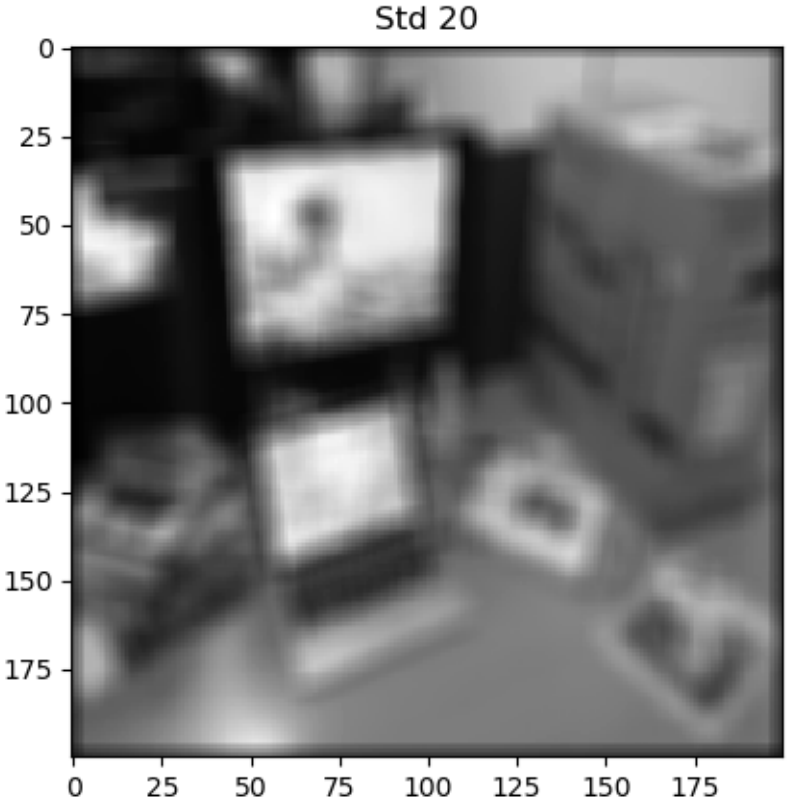
Gaussian filter with standard deviation 20

```
[[0.012 0.012 0.012 0.012 0.012 0.012 0.012 0.012 0.012]
 [0.012 0.012 0.012 0.012 0.012 0.012 0.012 0.012 0.012]
 [0.012 0.012 0.012 0.012 0.012 0.012 0.012 0.012 0.012]
 [0.012 0.012 0.012 0.013 0.013 0.013 0.012 0.012 0.012]
 [0.012 0.012 0.012 0.013 0.013 0.013 0.012 0.012 0.012]
 [0.012 0.012 0.012 0.013 0.013 0.013 0.012 0.012 0.012]
 [0.012 0.012 0.012 0.012 0.012 0.012 0.012 0.012 0.012]
 [0.012 0.012 0.012 0.012 0.012 0.012 0.012 0.012 0.012]
 [0.012 0.012 0.012 0.012 0.012 0.012 0.012 0.012 0.012]]
```

b)




Std 3
0
25
50
75
100
125
150
175
0
25
50
75
100
125
150
175

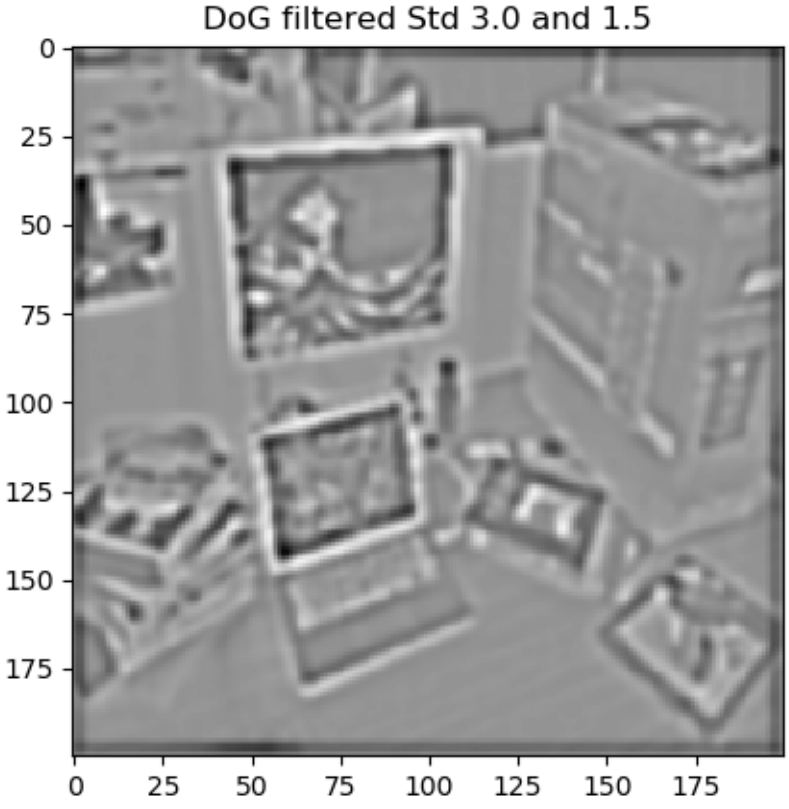

Std 20
0
25
50
75
100
125
150
175
0
25
50
75
100
125
150
175

Q2).
a)

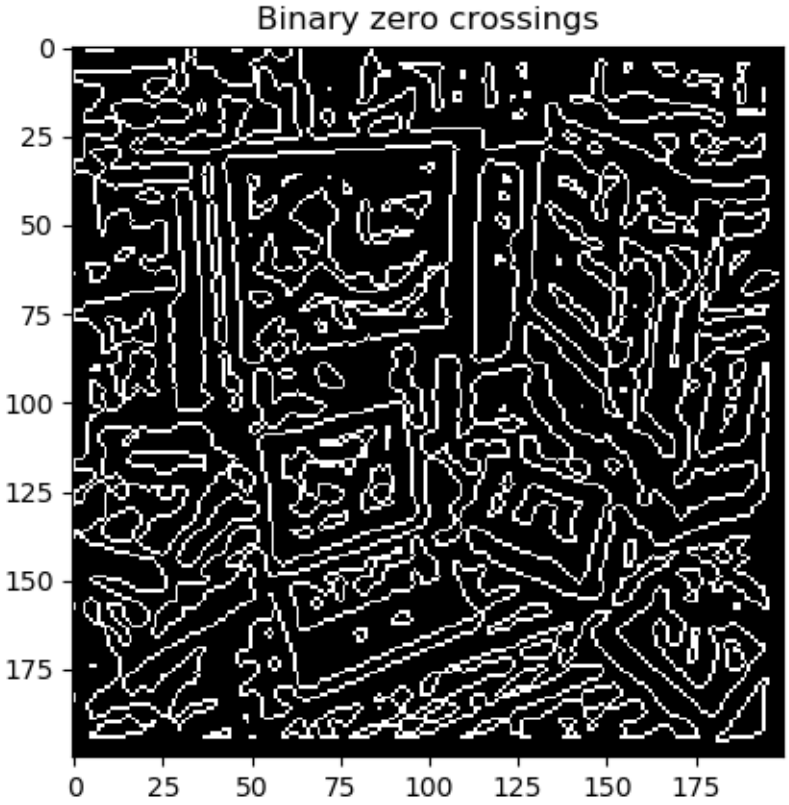
DoG with gaussians of Std 3.0 and 1.5

```
[[ 0.001  0.002  0.003  0.004  0.005  0.005  0.005  0.004  0.003  0.002   0.001]
 [ 0.002  0.003  0.005  0.006  0.006  0.006  0.006  0.006  0.005  0.003   0.002]
 [ 0.003  0.005  0.006  0.006  0.004  0.003  0.004  0.006  0.006  0.005   0.003]
 [ 0.004  0.006  0.006  0.001 -0.008 -0.013 -0.008  0.001  0.006  0.006   0.004]
 [ 0.005  0.006  0.004 -0.008 -0.027 -0.038 -0.027 -0.008  0.004  0.006   0.005]
 [ 0.005  0.006  0.003 -0.013 -0.038 -0.051 -0.038 -0.013  0.003  0.006   0.005]
 [ 0.005  0.006  0.004 -0.008 -0.027 -0.038 -0.027 -0.008  0.004  0.006   0.005]
 [ 0.004  0.006  0.006  0.001 -0.008 -0.013 -0.008  0.001  0.006  0.006   0.004]
 [ 0.003  0.005  0.006  0.006  0.004  0.003  0.004  0.006  0.006  0.005   0.003]
 [ 0.002  0.003  0.005  0.006  0.006  0.006  0.006  0.006  0.005  0.003   0.002]
 [ 0.001  0.002  0.003  0.004  0.005  0.005  0.005  0.004  0.003  0.002   0.001]]
```

b)



c)


Binary zero crossings
0
25
50
75
100
125
150
175
0
25
50
75
100
125
150
175