CV: Assignment 2

Anubhav Jain

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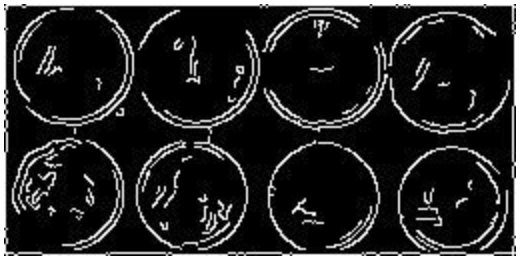
Q1.

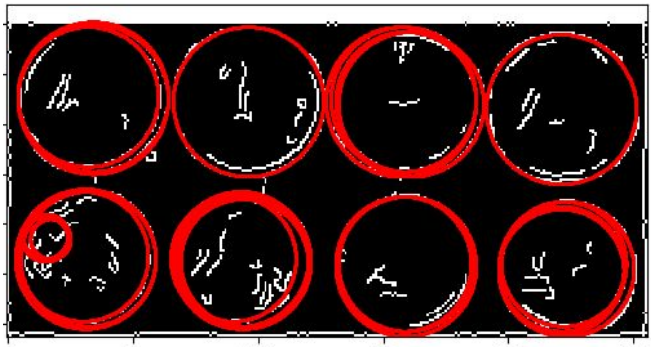
The first step is resizing the image to 1/4th of its original size keeping the aspect ratio the same. The is done to speed up the algorithm. The second step is using a gaussian filter and the a canny edge detector on the image. Which finds the edges in the image. Circular hough transform is used with a dynamic threshold for every radius value. The hough transform is only used on locations where an edge is detected. Using this dynamic thresholding approach I was able to detect the inner circles as well.

Output:

After Gaussian Filtering and Resizing

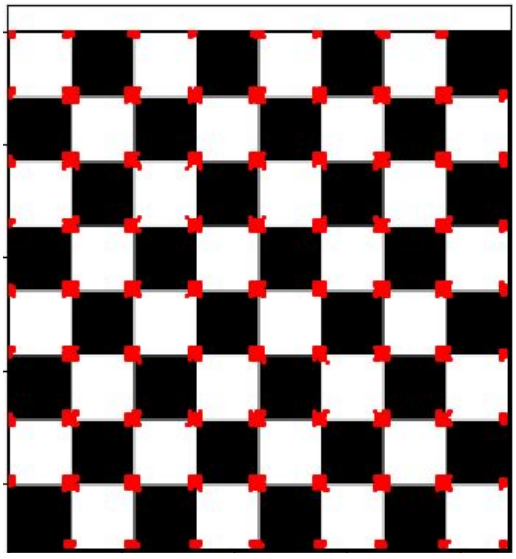


After Applying Canny Edge Detection

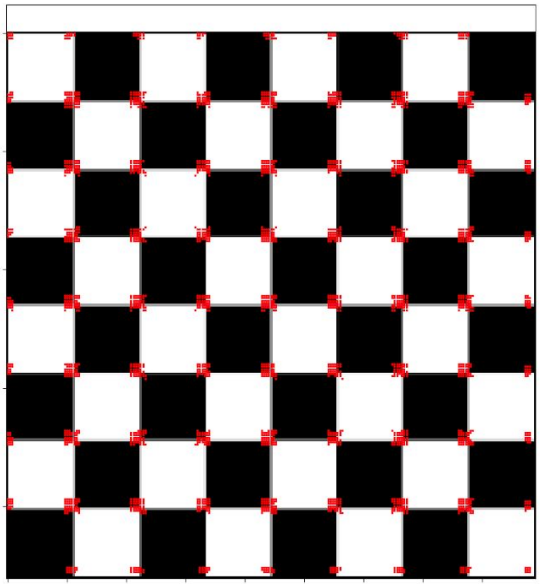


Output Image with circles detected

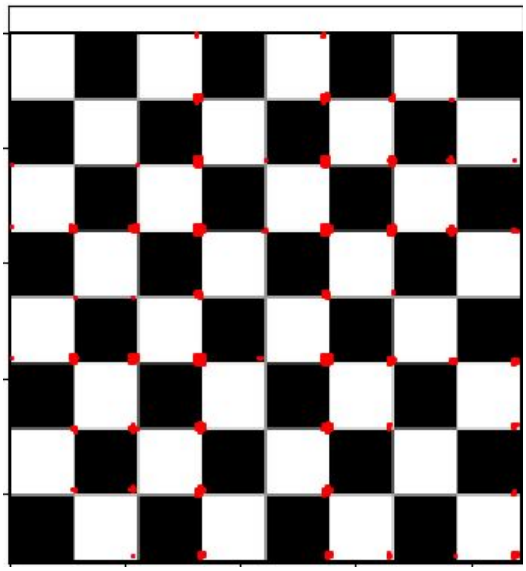
Q3.



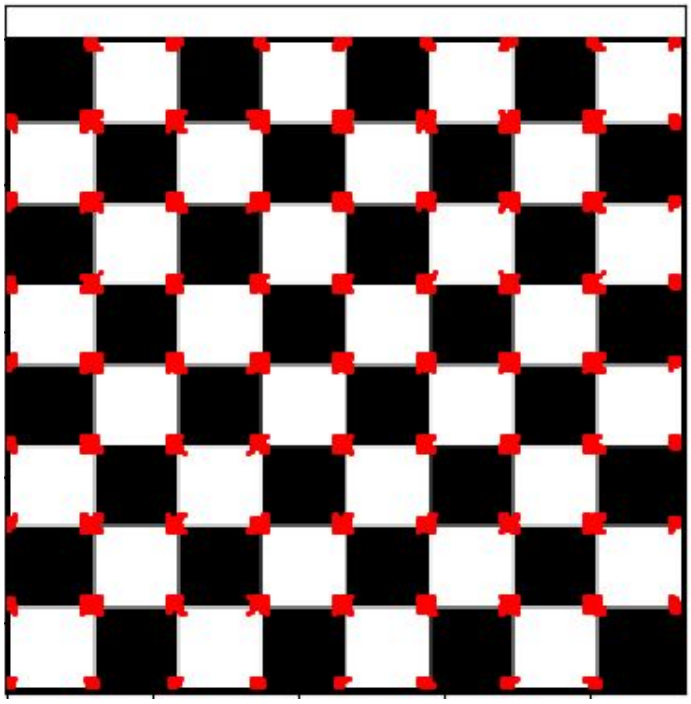
Threshold = -2



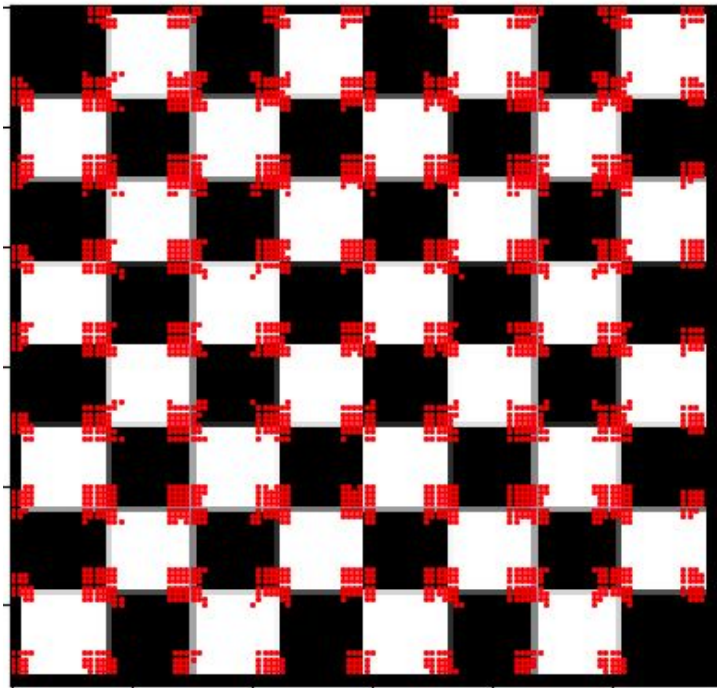
Threshold = - 4



Threshold = 5

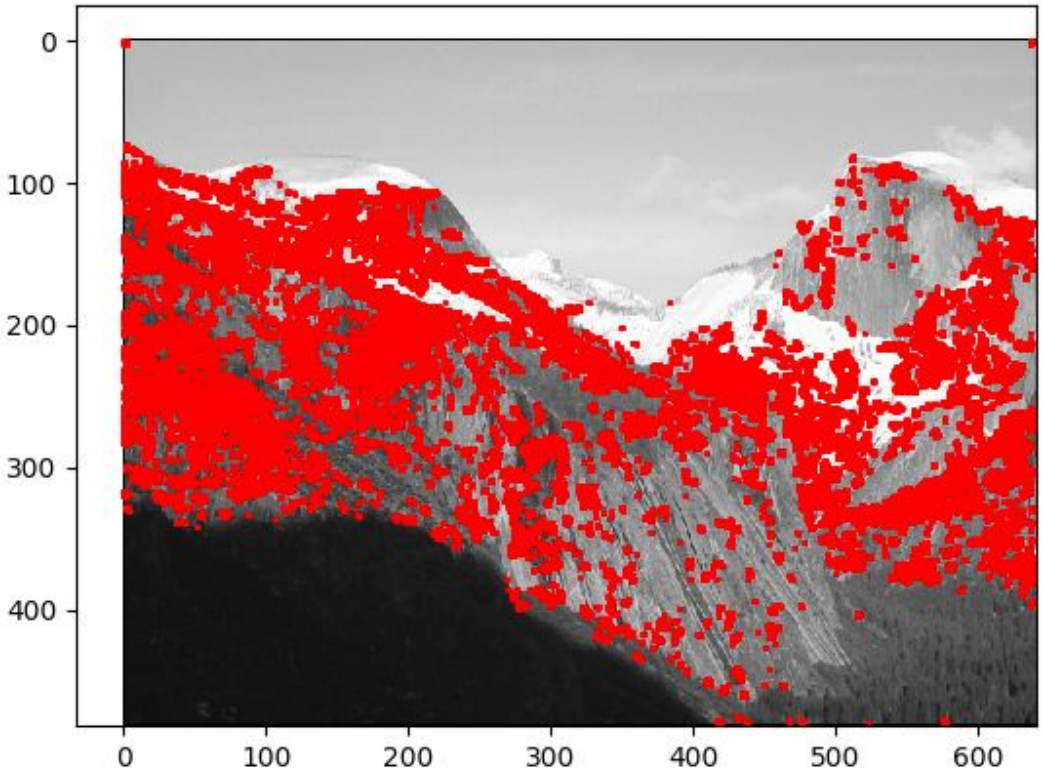


Upon Rotation by 90 degrees

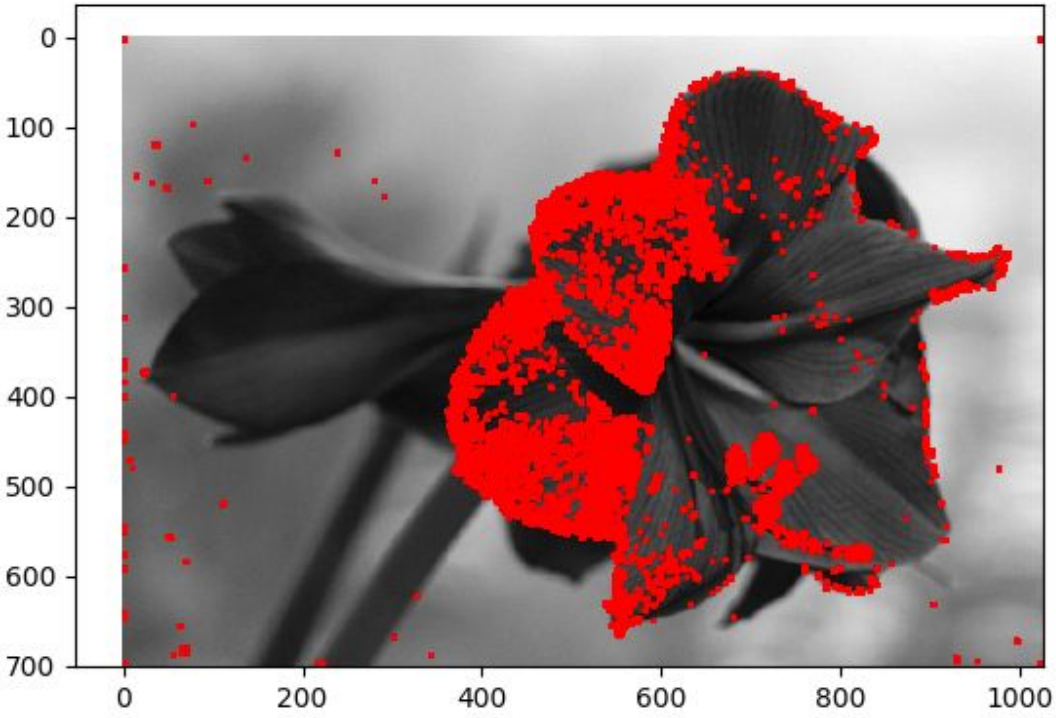


Upon Compression by a factor of 2

Upon rotation the same threshold gave good results however upon compression by a factor of 2 using bilinear interpolation shows poorer results on the same threshold value. This is because of lower resolution of the image upon compression. Upon increasing the threshold lesser number of points are detected and while lowering the threshold more points are detected and more edges are also classified as a corner.



Threshold is higher for the above image. The threshold was set to be 6 for a window size of 3.



Threshold is higher for the above image. The threshold was set to be 3 for a window size of 3.

Q2

Image	Rotation	Translation
13	-0.08044693 0.28333866 -0.04793964	-1.23831447 0.2430837 42.04310101
1	-0.03442755 0.09103047 -0.01577683	-4.51265377 -5.31373074 15.52207368
12	-0.01734266 0.31918912	-3.12477752 -5.68479639

	-0.03856701	18.70546076
7	0.39735132 0.80377953 1.5507719	8.78198339 -0.18729412 34.38038082
6	0.46710466 0.55725803 1.50980899	13.56949769 -3.42508941 26.36761884
14	-0.26769971 0.48976805 0.08026179	-1.07359636 -3.8397567 30.53319669
15	-0.36793967 -0.36600749 0.01767917	-10.27674793 3.87979899 55.01803999
2	-0.03634608 0.10372135 -0.00518211	-4.88814011 -5.29552292 16.38357896
5	0.49218349 -0.20811504 1.34338358	7.32123078 -4.24610488 17.15546934
4	-0.16120593 0.42282827 0.96600661	2.49943704 -8.0910674 22.55094776
9	0.0407269 -0.81762122 -0.02364989	-1.6261897 -5.63373467 17.19888244

Reprojection Error = 2.42537204895

Skew = 0

Camera Matrix:

[538.11785666 0. 327.92204495]

[0. 539.63623926 245.40485157]

[0. 0. 1]

Distortion Array: -0.18805464, 0.00155598, 0.00735325, 0.00049308, 0.14002325

Mean Error : 0.150199301248

Assuming Aperture Height= 1 and Aperture Size =1

Fovx = 47.1384566579

Fovy = 60.6293104296

Focal Length = 1.12107886805

Principal point = (0.6831709269816976, 0.38344508057843635)

Aspect ratio = 1.00282165437