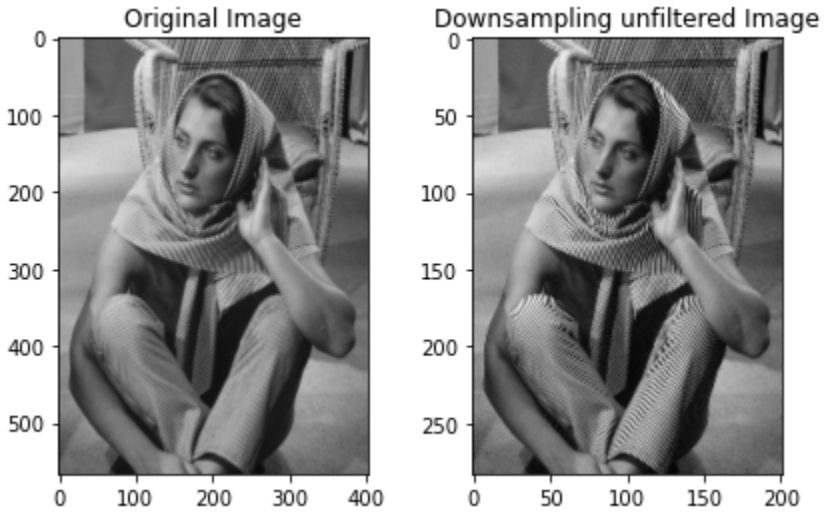
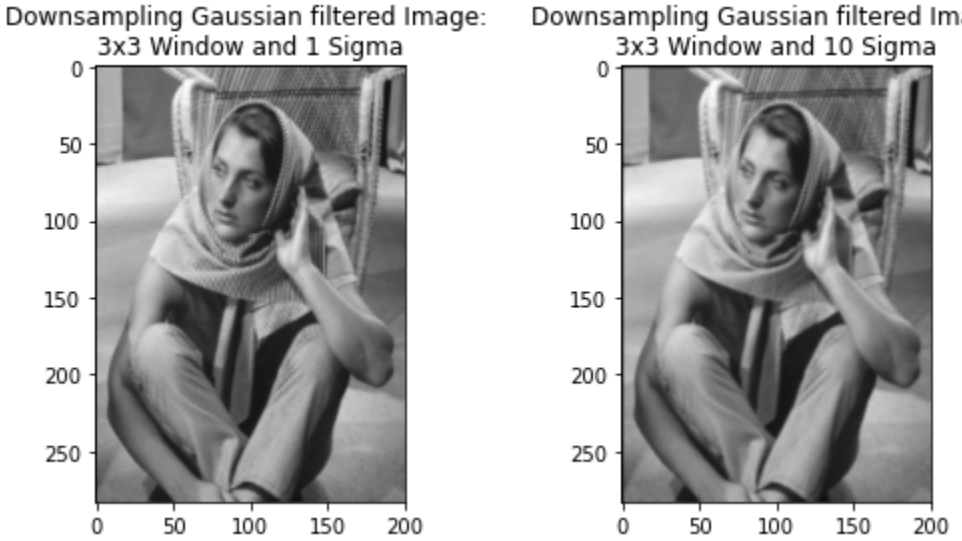
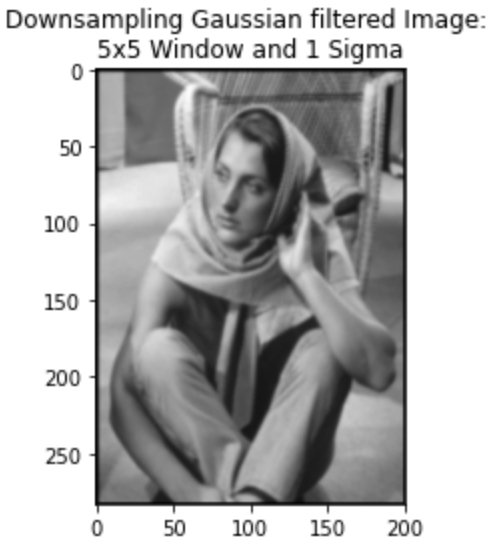
DIP Assignment 4

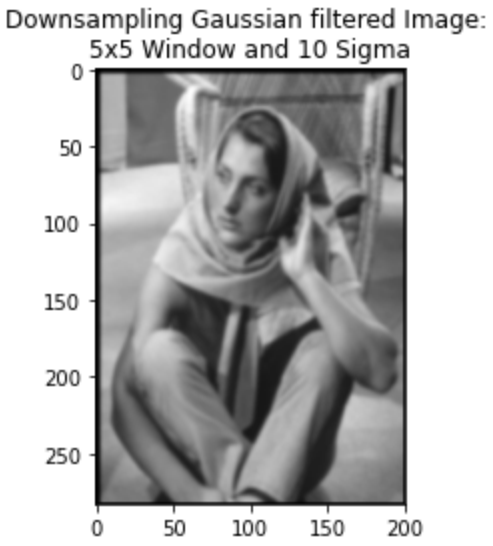
Q1. a) After downsampling the image by a factor of 2 in every direction, we can see the Ringing Artifacts.



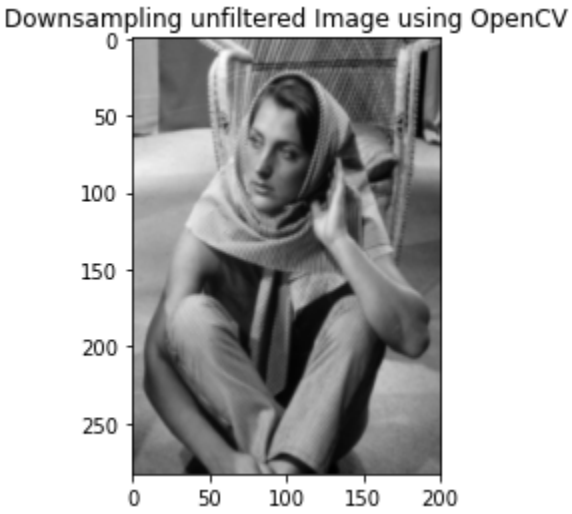
b) Results of downsampling the Gaussian filtered image with different window sizes and sigma values:





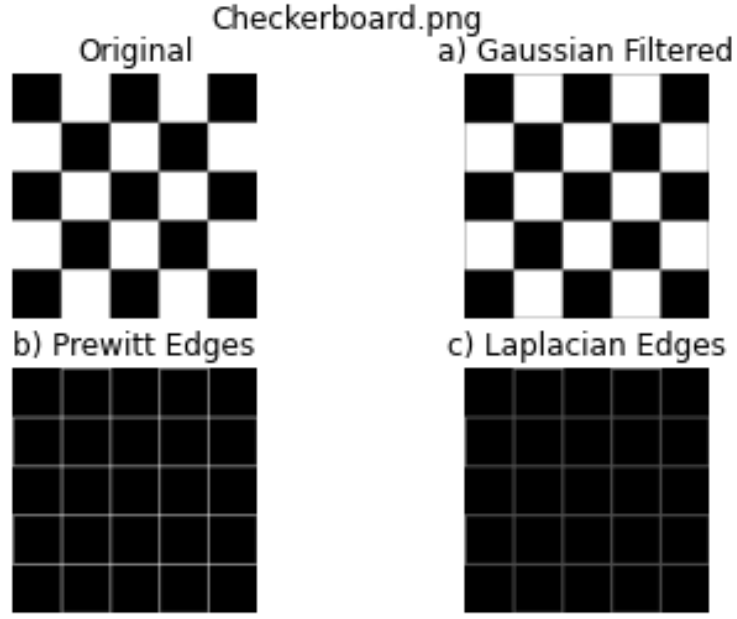


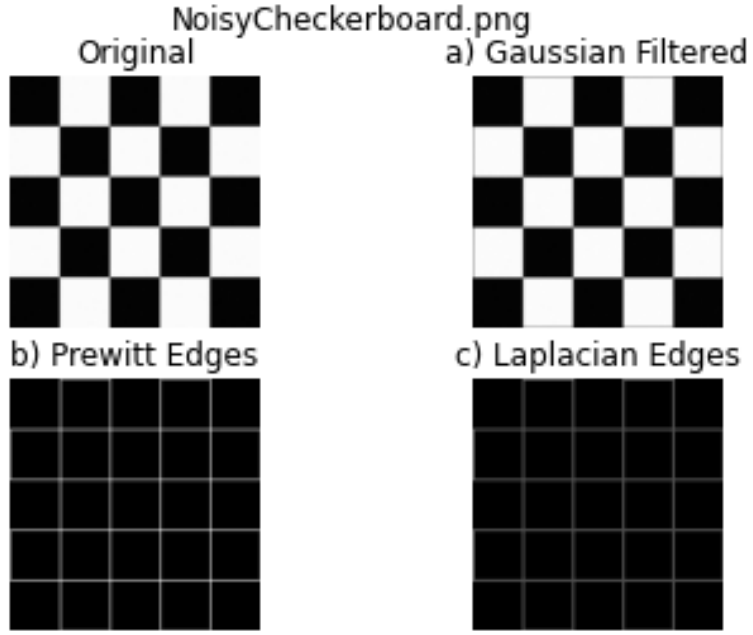
Result of downsampling using OpenCV's pyrDown function:

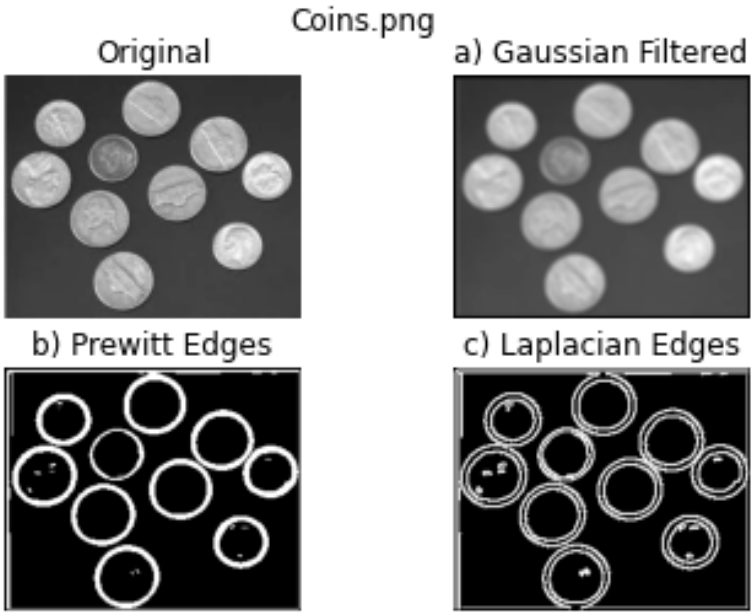


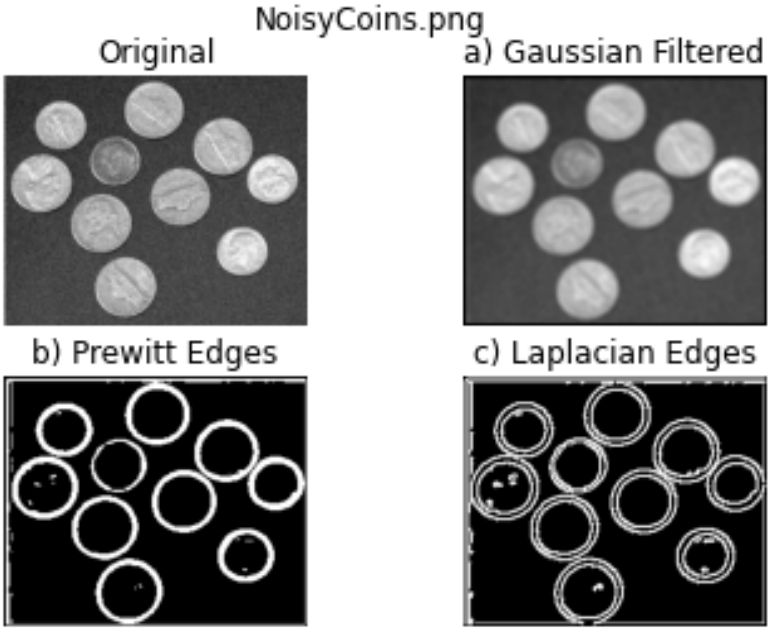
This result is similar to the downsampling done using a 3x3 window and sigma as 10.

Q2. Following are edges detected using Prewitt and Laplacian Operator on images. In case of noisy images, gaussian filtered is applied before detection:



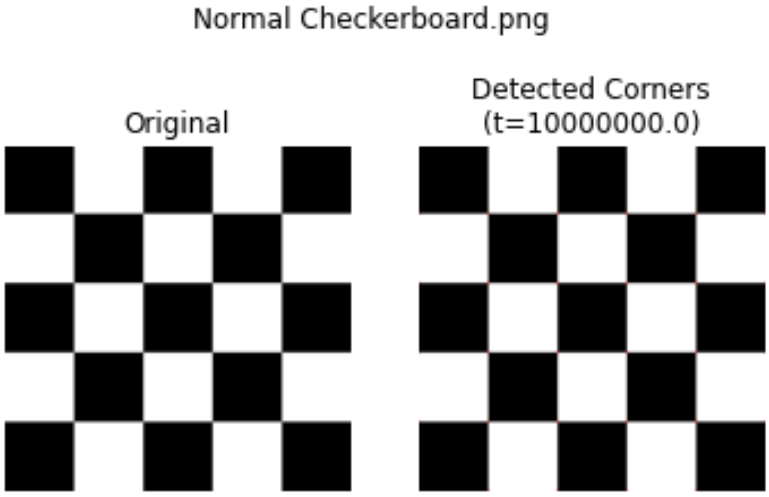


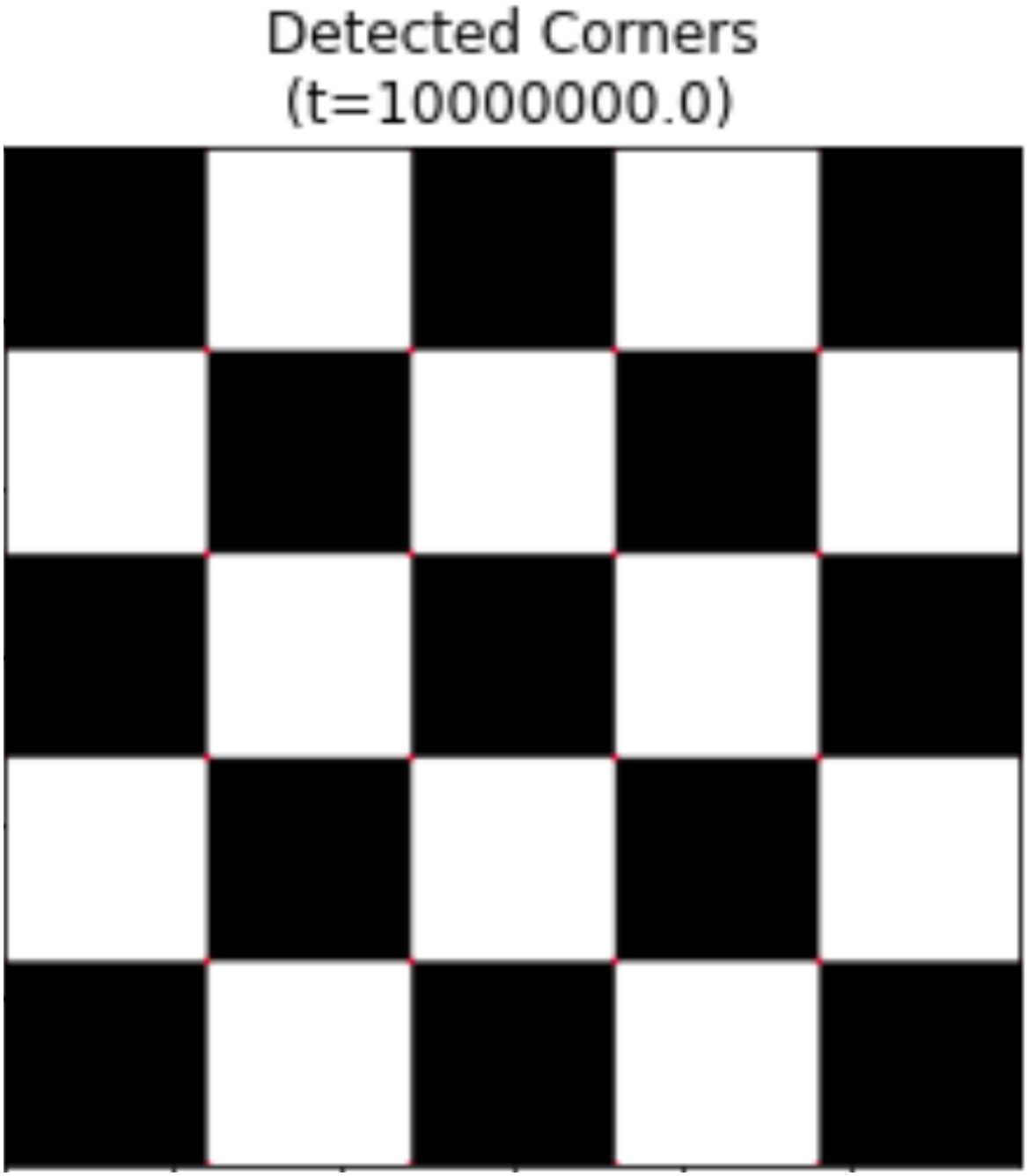




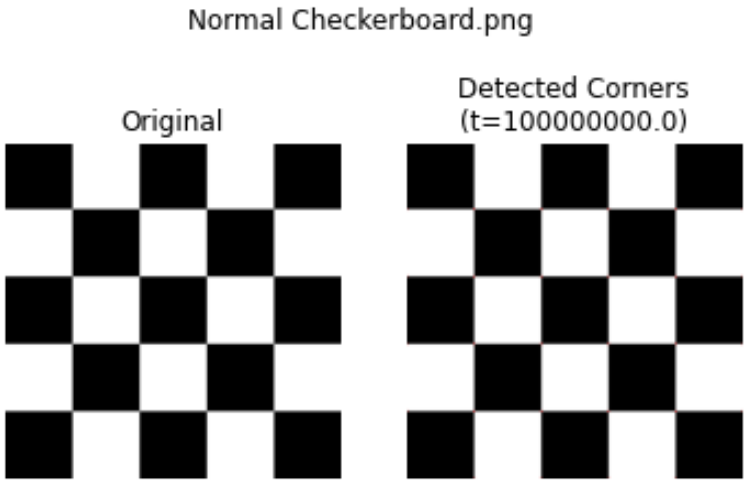
For both clean and noisy images, the Laplacian operator(2nd order gradient-based detector) works better than the Prewitt operator (1st order gradient-based detector). This can be seen in coins images where the edges of coins are more distinct for laplacian.

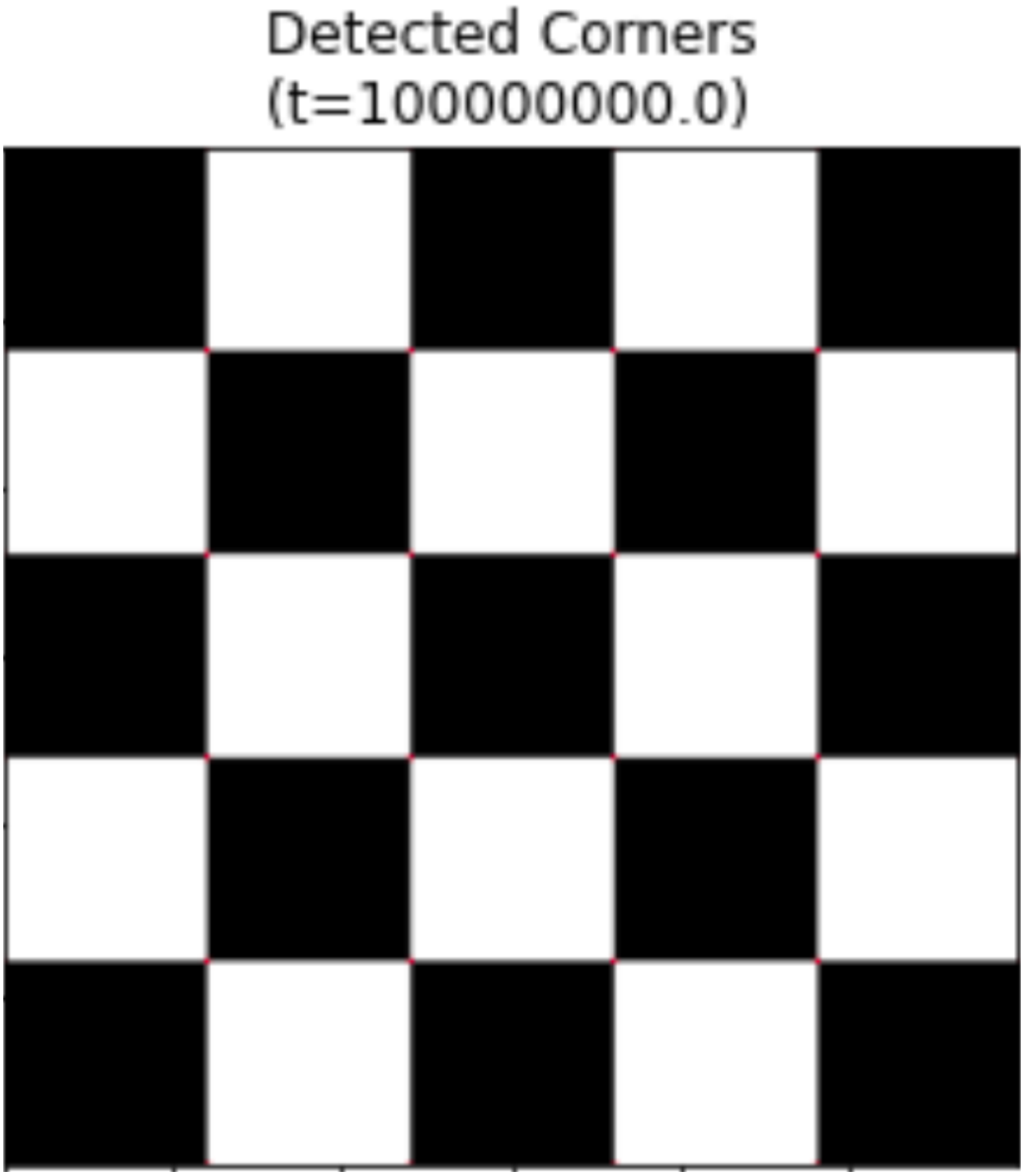
Q3. a) Harris corner detector with different threshold values:



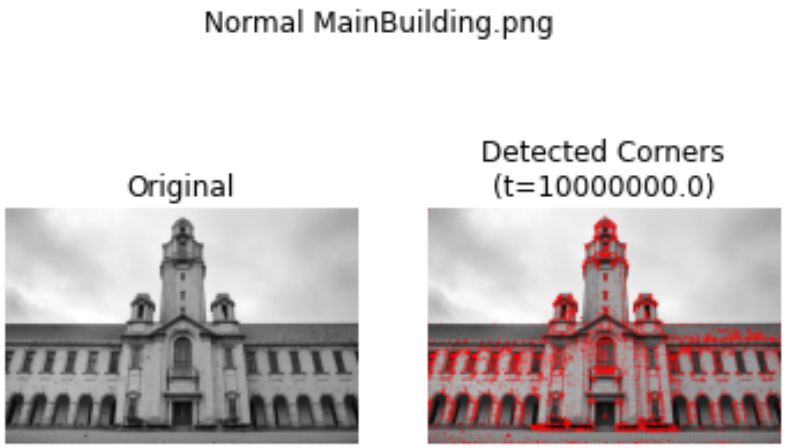


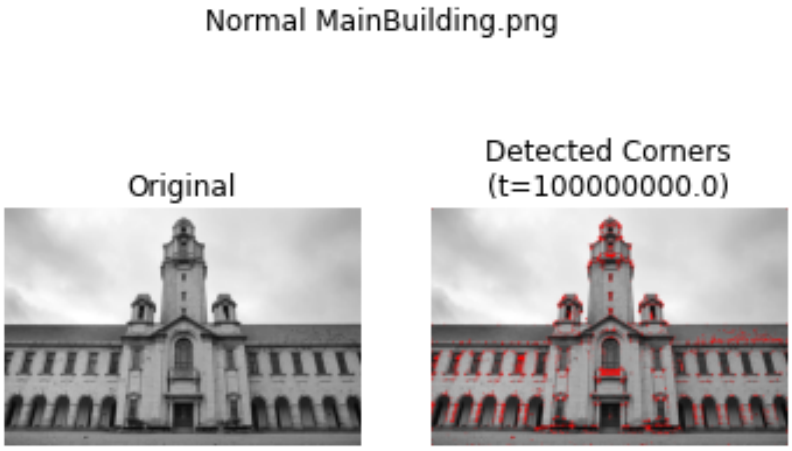
(The corners are detected as shown by red dots even if not visible in the subplot!)


Normal Checkerboard.png
Original
Detected Corners
(t=100000000.0)

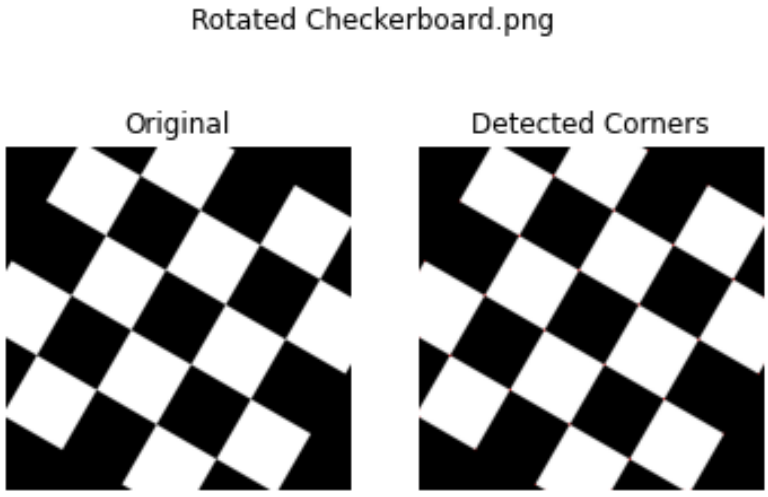


(The corners are detected as shown by red dot even if not visible in the subplot!)



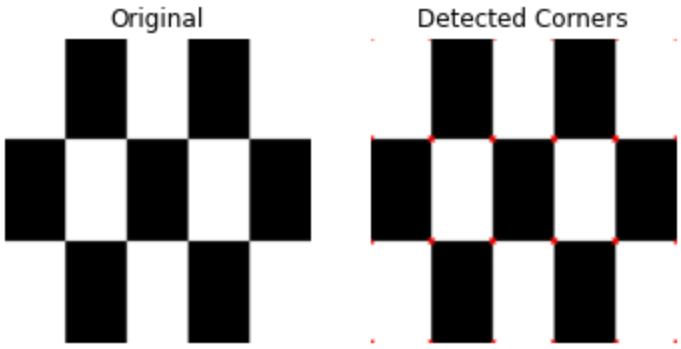


b) The plots of modified images:

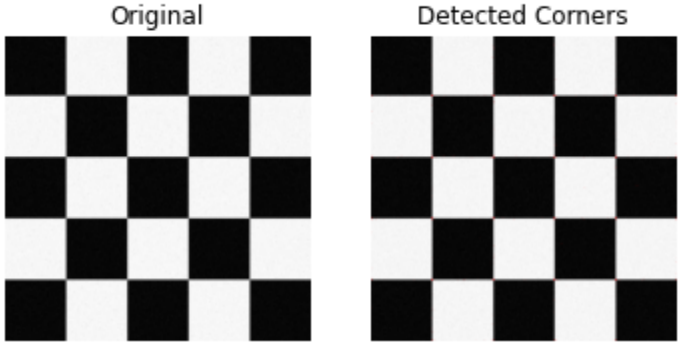


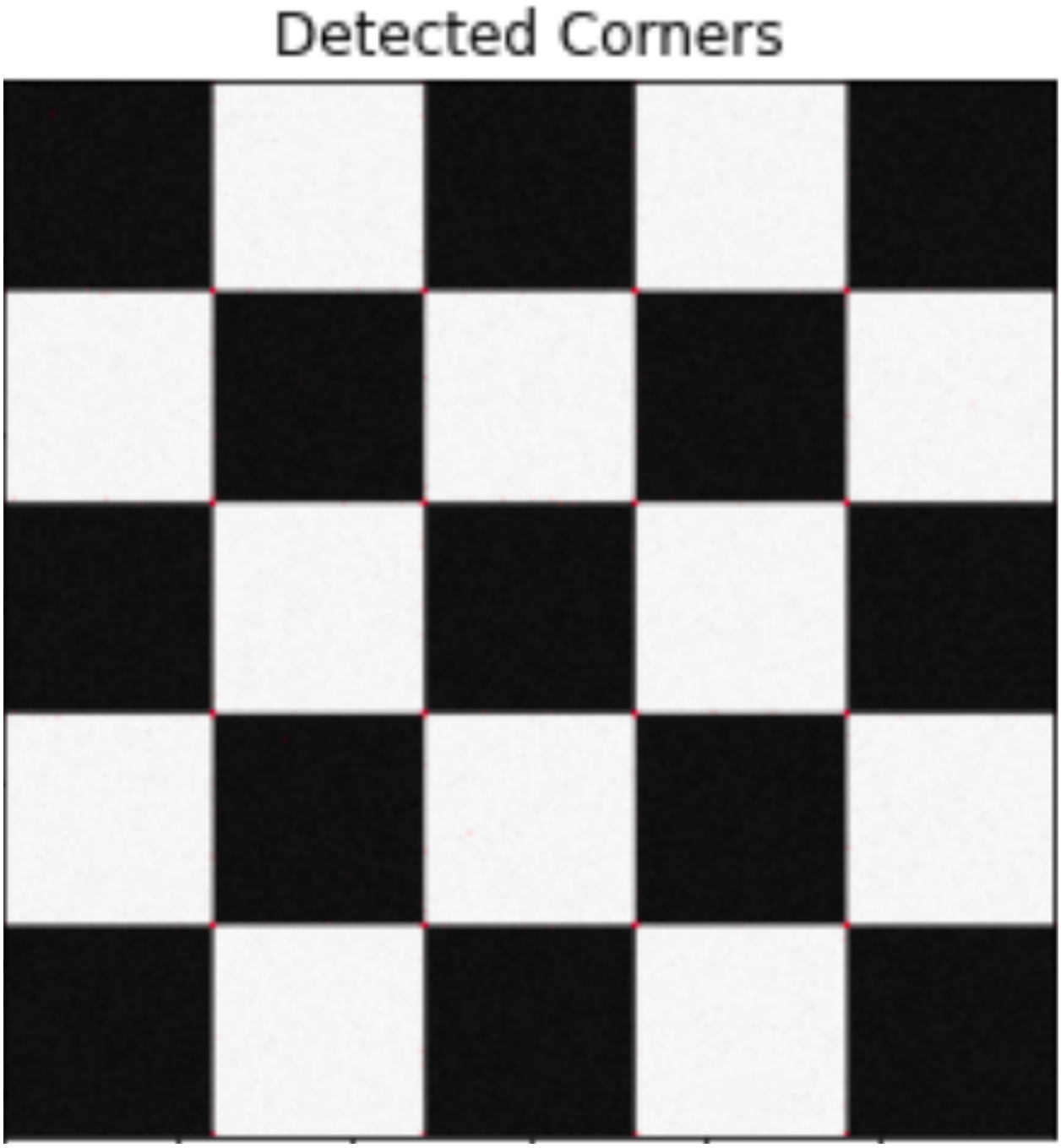
(The corners are detected as shown by red dot even if not visible in the subplot!)

Scaled Checkerboard.png



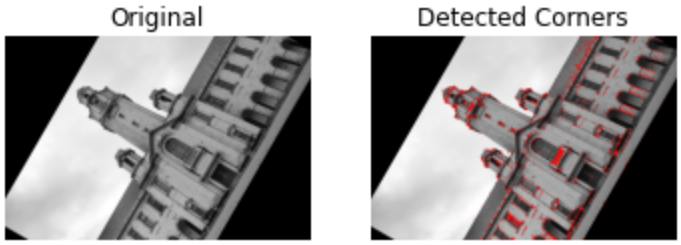
Noisy Checkerboard.png



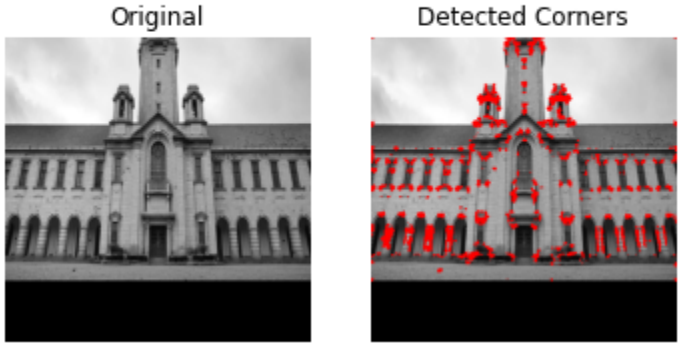


(The corners are detected as shown by red dot even if not visible in the subplot!)

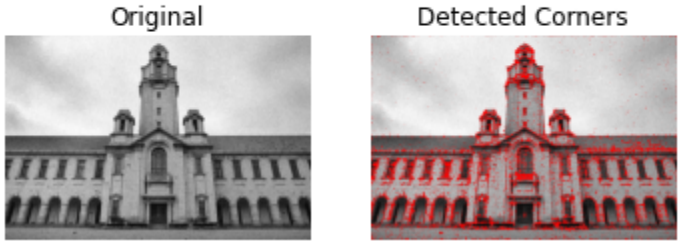
Rotated MainBuilding.png



Scaled MainBuilding.png



Noisy MainBuilding.png



As we can see, the harris corner detector is invariant of image scaling, rotating and noisy images. In the case of noisy images, the detector may need some adjustments in the threshold value.