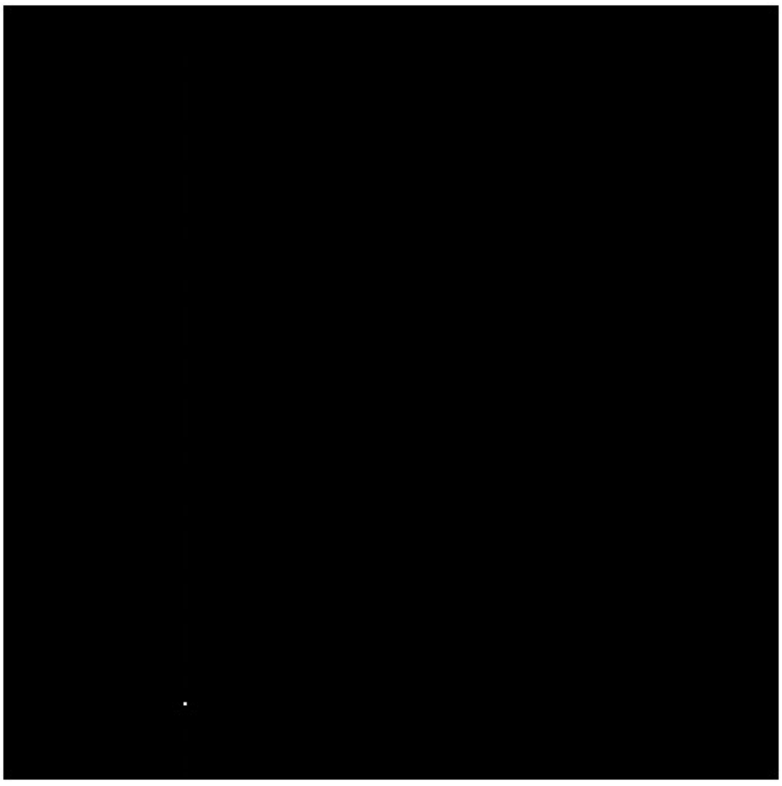
Assignment 5 – Report

Q5 a) Without Gaussian Noise

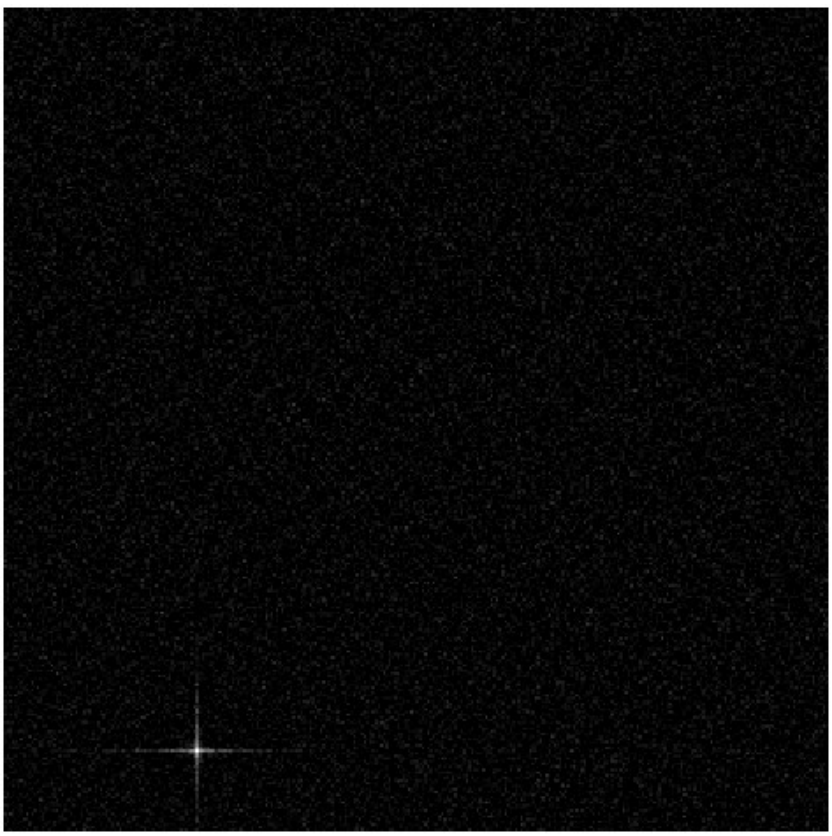
i) Log-magnitude of cross-power spectrum



ii) IFT plot

b) With added Gaussian noise

i) Log-magnitude of cross-power spectrum



ii) IFT plot

The translation is by 70, -30 and the image size is 300x300
So the IFT of cross spectrum should peak at (70, 300-30) = (70,270)

However MATLAB indexing begins at 1 and it wil show the peak at (71, 271).

The peak is observed at the same point with and without the addition of Gaussian noise.
However the peak with the addition of noise contains some noisy artifacts.

Considering images of size NxN:

Time complexity : $O(N^2 \log N)$

Time complexity of pixel-wise image comparison procedure

$O(N^4)$

Approach for correcting for rotation between two images:

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→ If $f_1(x,y)$ on rotation by angle θ_0 gives $f_2(x,y)$, then

$$f_2(x,y) = f_1(x\cos\theta_0 + y\sin\theta_0, -x\sin\theta_0 + y\cos\theta_0)$$

Then:

$$F_2(u,v) = F_1(u\cos\theta_0 + v\sin\theta_0, -u\sin\theta_0 + v\cos\theta_0)$$

if A_1, A_2 are the magnitudes of F_1, F_2

$$A_2(u,v) = A_1(u\cos\theta_0 + v\sin\theta_0, -u\sin\theta_0 + v\cos\theta_0)$$

Magnitudes of both spectra are same subjected to rotation.

If we represent the rotation ~~as~~ in polar representation as ~~pol~~ translational displacement, we get

$$A_1(\rho,\theta) = A_2(\rho, \theta-\theta_0)$$

from which θ_0 can be obtained using phase co-relation