

Assignment 5 DFT: Question 6

We read the given paper ‘*An FFT-Based Technique for Translation, Rotation, and Scale-Invariant Image Registration*’. Equation 3 from the paper was implemented in Python 3 code to register 2 sets of images as described in the paper.

Implementation

The following function implements the algorithm.

```
def register_translation(a, b):  
    assert a.shape == b.shape  
    h, w = a.shape  
    A = F.fft2(a)  
    B = F.fft2(b)  
    x_spec = np.abs(F.ifft2((A * B.conjugate())/abs(A*B)))  
    t_y, t_x = np.unravel_index(np.argmax(x_spec), (h, w))  
    t_y = t_y-h if t_y > h//2 else t_y  
    t_x = t_x-w if t_x > w//2 else t_x  
    return t_x, t_y, x_spec
```

Case I

The results without noise was $t_x = -30, t_y = 70$ which is correct.

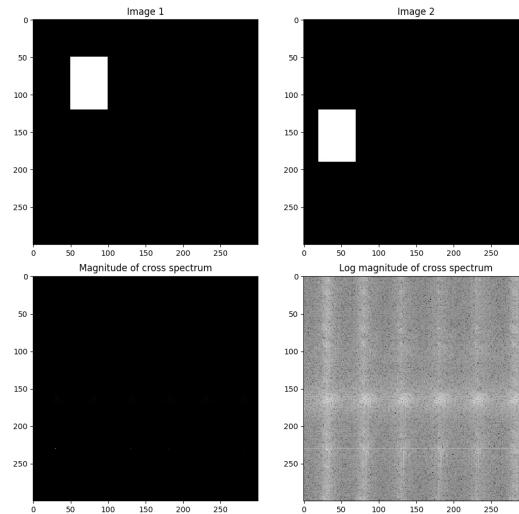


Figure 1: Result 1

Case II

The results obtained for the case with $N(0, 20)$ noise were $t_x = -30, t_y = 70$ which is correct.

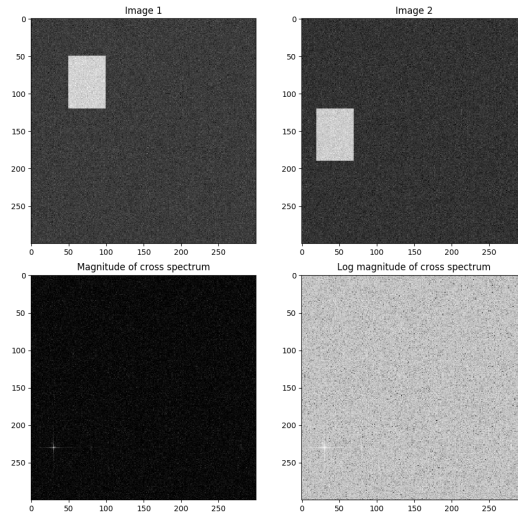


Figure 2: Result 2

Time Complexity