Assignment 5 DFT : Question 1

Team Members

- Mohd Safwan
- Manas Vasishtha
- Sumrit Gupta

Solution

We know that,

$$g_1 = f_1 + h_2 * f_2, g_2 = h_1 * f_1 + f_2$$

We will now analyze these equations in the frequency domain (Fourier Transform).

$$G_1 = F_1 + H_2 F_2, G_2 = H_1 F_1 + F_2$$

This is a pair of linear equations in 2 variables. We solve for F_1 and F_2 to get

$$F_1 = \frac{G_1 - H_2 G_2}{1 - H_1 H_2}, F_2 = \frac{G_2 - H_1 G_1}{1 - H_1 H_2}$$

Now the answer is simply

$$f_1 = F^{-1}(F_1), f_2 = F^{-1}(F_2)$$

Inherent Problem in Solution

We know that h_1 and h_2 are blurring kernels. Their fourier transforms H_1 and H_2 act as low pass filters and do not tend to amplify images. Thus, for low frequencies, the term $H_1 H_2$ approaches 1, so the denomiator approaches 0. This is not desirable because this will amplify noise for low frequencies.