DFT:Q1 Report

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).

$$G_1 = F_1 + H_2F_2 \, , \, G_2 = H_1F_1 + F_2$$

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

$$F_1 = \frac{G_1 - H_2G_2}{1 - H_1H_2} \, , \, F_2 = \frac{G_2 - H_1G_1}{1 - H_1H_2}$$

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_1H_2 approaches 1, so the denominator approaches 0. This is not desirable because this will amplify noise for low frequencies.