

CS 663 Assignment 5

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QUESTION 1

$$\begin{aligned}g_1 &= f_1 + h_2 * f_2 \longleftrightarrow G_1 = F_1 + H_2 F_2 \\g_2 &= f_2 + h_1 * f_1 \longleftrightarrow G_2 = F_2 + H_1 F_1 \\G_1 &= F_1 + H_2(G_2 - H_1 F_1) \\G_1 &= (1 - H_1 H_2)F_1 + H_2 G_2 \\F_1 &= \frac{G_1 - H_2 G_2}{1 - H_1 H_2} \\F_2 &= \frac{G_2 - H_1 G_1}{1 - H_1 H_2}\end{aligned}$$

This formula will be a problem when $\mathbf{H1H2} = \mathbf{1}$. In other words whenever the product of the respective blurring kernels are near unity, then the estimated images $\mathbf{F1}$ and $\mathbf{F2}$ will blow up for the particular frequency in the Fourier domain. This will give us extremely inaccurate images on taking the inverse Fourier transform.

As this instability (ie. $\mathbf{H1H2} = \mathbf{1}$) can occur at arbitrary frequencies, there is no simple way (eg. a low pass filter like in Wiener filters) of negating the effects of these unstable points.