# CS663 Assignment 4 - Question 2

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The equation given when the outside scene is in focus is

$$g_1 = f_1 + h_2 * f_2 \tag{1}$$

And for the instance when the relfected scene is in focus

$$g_2 = h_1 * f_1 + f_2 \tag{2}$$

where, $g_1$ and $g_2$ are the final images in the above cases respectively
$f_1$ and $f_2$ are the original images of the outside scene and reflected scene respectively
$h_1$ and $h_2$ are the blur kernels for the blurring of outside and reflected scene in the above cases respectively

Taking the Fourier Transform of both the equations, we get

$$G_1 = F_1 + H_2 F_2 \tag{3}$$

$$G_2 = H_1 F_1 + F_2 \tag{4}$$

Solving equations (3) and (4), we get

$$F_1 = \frac{H_2 G_2 - G_1}{H_2 H_1 - 1} \tag{5}$$

$$F_2 = \frac{H_1 G_1 - G_2}{H_1 H_2 - 1} \tag{6}$$

Now by taking the inverse Fourier Transform of $F_1$ and $F_2$ we can get $f_1$ and $f_2$ respectively

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

In both these equations, there is $(H_1 H_2 - 1)$ in the denominator.
Now as we are taking the Inverse Fourier Transform, the Transforms will not be very accurate as $H_1 H_2$ approaches to 1
Therefore, this method is not very useful when $H_1 H_2 \to 1$

Also, as $g_1$ and $g_2$ are two different images the noises in them will be two identical but independent random variables. As the noises are independent we can only say that the variance of noise in the final image may be higher than the original two images.

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