**Homework:**

**a)** Explain why simple inverse filtering generally cannot recover problems such as 2a)

Answer:

In 2a) we degraded our image with noise. Assume that we have filter which is has zeros at frequency domain when it multiply by image all information at those frequencies is lost and simple inverse to an image goes to infinite gain at those zeros.so in this kind of filter we have loss of information.

**b)** What are the drawbacks of the two Wiener filter versions applied in 2c and 2e?

Answer:

Wiener filter combines inverse filtering with a prior statistical knowledge about the noise and image in order to deal with the problems. In other word image and noise spectrum are known.

For 2c we know the statistical property of noise (mean and variance) so in comparison with 2e it more straightforward. But in 2e as in most cases, we don’t have any information about noise and I think one of the disadvantage of this filter is its dependency on noise which is an unpredictable.

The other drawback is H(u,v) = 0, for some u, v. e.g. motion blur.

**c)** Constrained Least Squares filtering is another approach tackling image restoration. What are the main differences compared to Wiener filtering?

Answer:

Their formula is almost the same, but in Constrained Least Squares filter power spectrum ratio is replaced with function that varies with frequency (P(u,v)).

Wiener filter emphasizes high-frequency components, while images tend to be smooth.

**Wiener Filtering**

K = Sn(u,v)/Sf(u,v)

**Constrained Least Squares Filtering**

Gamma is adjustment factor

**P(u,v) is the Fourier transform of smoothness criterion function**