The Wiener filter

The non-causal frequency-domain Wiener filter is designed for its application in the frequency domain and is based on the relative amounts of signal and noise present at each frequency. The transfer function of the optimal (non-causal) Wiener filter is defined by:



Where H[f] is the frequency response of the filter, N[f] the frequency spectra of the noise and S[f] the frequency spectra of the signal.

This can also be written as:



where SNR(f)=S[f]2/N[f]2 is the signal to noise ratio expressed in terms of the power-spectral ratio. Also for additive noise, the Wiener filter attenuates each frequency component in proportion to an estimate of the signal to noise ratio.

The Wiener filter is optimal in the sense that it maximizes the ratio of the signal power to the noise power . It is important to note that this filter is not an adaptive filter (it does not self-adjust its transfer function according to some optimization algorithm controlled by the error signal). Indeed, the filter assumes that the inputs are stationary.