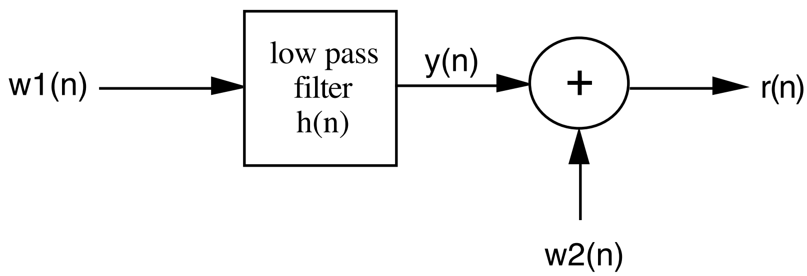
# Transfer Function and Coherence Function Estimation

Implement the following measurement model:




where: wl(n) is a Gaussian random sequence with mean = 0 and var = 1.
w2(n) is a Gaussian random sequence with mean = 0 and var = $\frac{1}{32}$.

$$h(n) = \frac{1}{8},\ n = 0, \ldots, 7.$$

Generate 1024-point time series wl(n), w2(n), y(n) , and r(n). All frequency domain estimates should be made using 128 - point FFT's. Overlap successive data segments by 50% and use a good window function. Appropriately normalize both power spectral and cross-spectral estimates. Plot the following:

A Transfer function of h(n) (dB magnitude, linear magnitude, phase).

B. Power spectral estimates $\hat{S}_{w1,w1}(f)$, $\hat{S}_{w2,w2}(f)$, $\hat{S}_{y,y}(f)$, and $\hat{S}_{r,r}(f)$ (dB and linear).

C. Cross-power spectral estimates $\hat{S}_{y,w1}(f)$ and $\hat{S}_{r,w1}(f)$ (dB magnitude, linear magnitude, and phase).

D. Transfer function estimates $\hat{H}_{w1,y}(f)$ and $\hat{H}_{w1,r}(f)$ (dB magnitude, linear magnitude, and phase).

E. Magnitude-squared coherence function estimates $\hat{\gamma}^2_{w1,y}(f)$ and $\hat{\gamma}^2_{w1,r}(f)$ (linear).

Comment on your results - particularly with regard to the confidence intervals of your transfer function and coherence function estimates (e.g. both tabulate and illustrate with vertical bars the 90% confidence intervals of your transfer function and coherence estimates at f = 0, f = 0.1875, and f = 0.3125 cycles/sample). Indicate clearly what you have done when the estimated coherence is outside the range available in the table.

Note: Confidence intervals for the coherence function generally are tabulated for $\gamma^2(f)$.