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誠,樸,精,勤


# Matlab HW7: Exercise from Chap 4

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# Matlab HW5

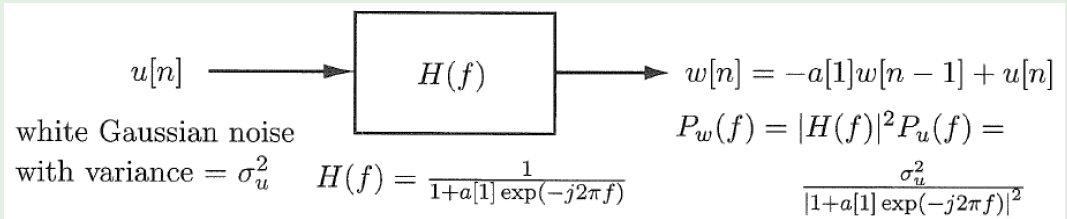
1. Exercise 4.4: AR(1) PSD - lowpass or highpass
2. Exercise 4.5: Filter frequency response
3. Exercise 4.12: Verification of the PSD

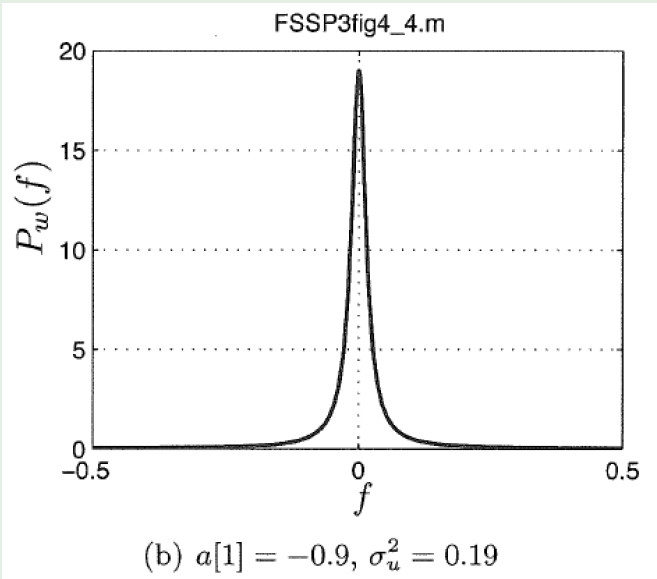
# AR(1) PSD - lowpass or highpass

## Example 1 (Exercise 4.4: AR(1) PSD - lowpass or highpass)

Choose for the AR parameters $a[1] = 0.9$ and $\sigma_u^2 = 0.19$.

1. Using **ARpsd.m** obtain values of the AR(1) PSD and the corresponding frequencies and plot the results.
2. Compare the PSD against the one $a[1] = -0.9$ and $\sigma_u^2 = 0.19$ as shown in the left figure below. What can you say about the effect of the sign of $a[1]$ upon the PSD?



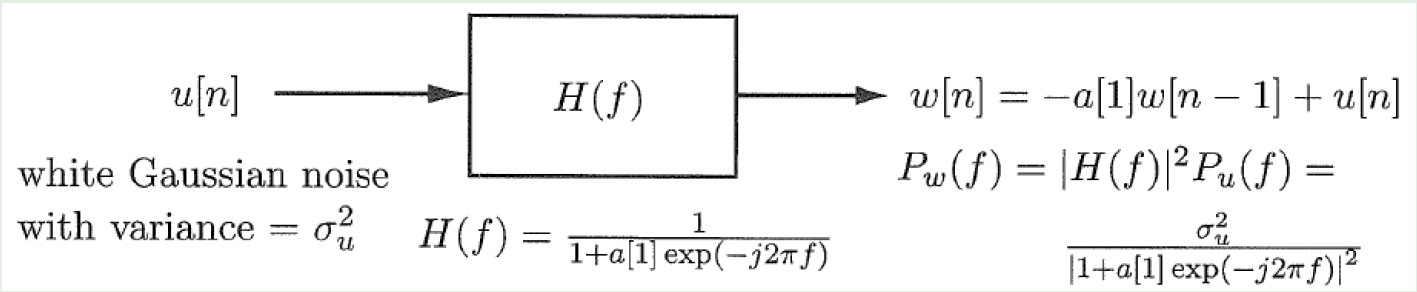

(b) $a[1] = -0.9$, $\sigma_u^2 = 0.19$

**[FSSP3exer4_4.m]**

# Filter frequency response

## Example 2 (Exercise 4.5: Filter frequency response)

Plot the magnitude of the filter frequency response given by (4.5) for $-1/2 \leq f \leq 1/2$ using $a[1] = -0.9$.

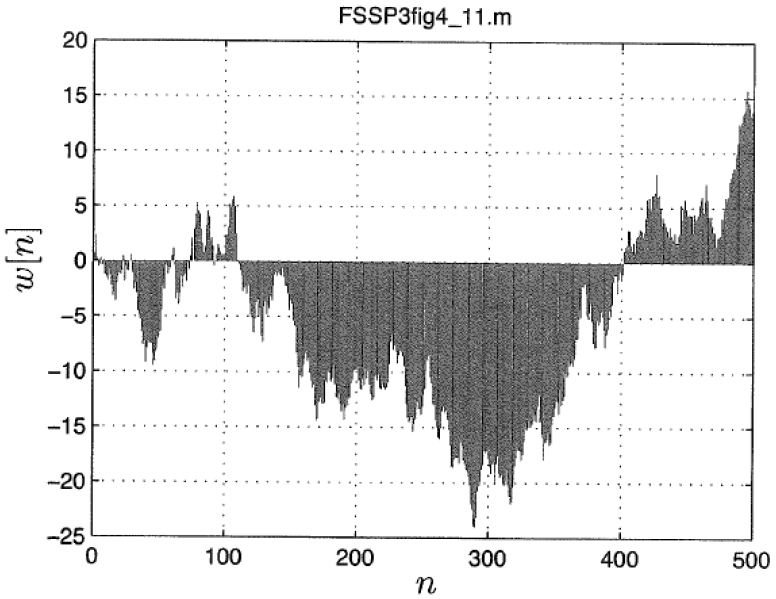



**[FSSP3exer4_5.m]**

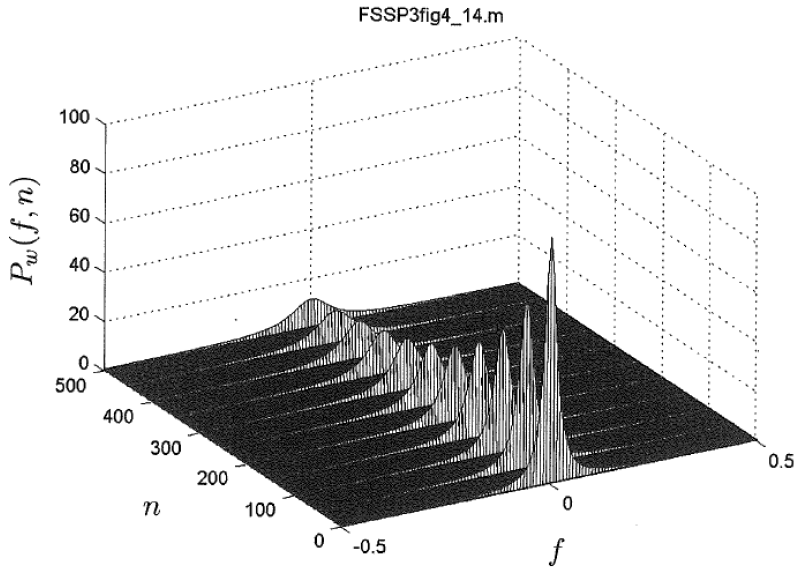
# Verification of the PSD

## Example 3 (Exercise 4.12: Verification of the PSD)

Using **ARpsd.m**, plot the PSD for AR process where $\sigma_u^2 = 1$ and $a[1] = -0.9$, $a[1] = -0.8$, and $a[1] = -0.7$. Compare your results to Fig. 1. Note at which times the AR(1) filter parameters takes on these values from the expression $a[1, n] = -0.9 + 0.2(n/N)$.




(c) random walk




(d) PSD

Figure 1: (a) Realization of random walk (Wiener process); (b) $P_w(f, n)$ for $n = 0, 50, 100, \ldots, 500$: Time-varying power spectral density for the AR$(1)$ dynamical noise process. The AR$(1)$ filter has a time-varying and constant excitation noise variance.


Question & Answer