Assignment 7

AI1110: Probability and Random Variables

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PROBABILITY, RANDOM VARIABLES, AND STOCHASTIC PROCESSES
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LaTeX

Example 15.2

Suppose-that s[n] is a first-order AR process and v[n] is white noise orthogonal to s[n]:

$$S_s s(z) = \frac{N_0}{(1-az^{-1})(l-az)} \tag{1}$$

$$S_v v(z) = N \tag{2}$$

$$S_s v(z) = 0 \tag{3}$$

In this case,

$$S_x x(z) = S_s s(z) + N = \frac{aN(l - bz^{-1})(1 - bz)}{b(1 - az^{-1})(1 - az)} \tag{4}$$

where $0 < b < a < 1$ and $b + b^{-1} = a + a^{-1} + \frac{N_0}{aN}$

Example (cont.)

Hence

$$H(z) = \frac{bN_0}{aN(1-bz^{-}1)(1-bz)} \tag{5}$$

$$h[n] = cb^{|n|} \tag{6}$$

$$c = \frac{bN_0}{aN(1-b^2)} \tag{7}$$

$$P = \frac{bNo}{1-a^2}[1\text{- } c\sum_{k=-\infty}^{k=\infty}(ab)^{|k|}] \tag{8}$$

$$P = \frac{bN_0}{a(1-b_2)} \tag{9}$$