Assignment 2

Pouyan Keshavarzian
ENEL 671: Adaptive Signal Processing

October 15, 2016

Problem 1.

$$R = \begin{bmatrix} 2 & 1 & 0.75 & 0.5 & 0.25 \\ 1 & 2 & 1 & 0.75 & 0.5 \\ 0.75 & 1 & 2 & 1 & 0.75 \\ 0.5 & 0.75 & 1 & 2 & 1 \\ 0.25 & 0.5 & 0.75 & 1 & 2 \end{bmatrix}$$

Filter Order	Eigenvalue Spread	Corresponding Upper Bound, μ
2	3.0	0.5
3	4.2088	0.333
4	5.0396	0.25
5	5.6864	0.2

Table 1: Problem 1 Calculations

You could not use a value close to the upperbound of the second order filter for the fifth order because it exceeds the upper bound therefore the filter would diverge.

Problem 2.

$$P = \begin{bmatrix} 0.5 \\ 0.25 \\ 0.125 \\ 0.0625 \\ 0.03125 \end{bmatrix}$$

The calculated tap-input vectors for their corresponding filter orders are shown below:

$$W_0 2 = \begin{bmatrix} 0.25 \\ 0 \end{bmatrix} W_0 3 = \begin{bmatrix} 0.2571 \\ 0.0.0179 \\ -0.0420 \end{bmatrix} W_0 4 = \begin{bmatrix} 0.2575 \\ 0.0219 \\ -0.0325 \\ -0.0251 \end{bmatrix} W_0 5 = \begin{bmatrix} 0.2577 \\ 0.0217 \\ -0.0331 \\ -0.0266 \\ 0.0037 \end{bmatrix}$$

Filter Order	MMSE
2	0.8750
3	0.8723
4	0.8714
5	0.8714

Table 2: Problem 2 Calculations

Filter order 4 and 5 give almost an identical MMSE as the filter has converged.