EEL 6504

Hmw # 5

Due November 10, 2015

Problem I

An "unknown" plant has transfer function

$$H(z) = \frac{0.0563 - 0.0009z^{-1} - 0.0009z^{-2} + 0.0563z^{-3}}{1 - 2.129z^{-1} + 1.7834z^{-2} - 0.5435z^{-3}}$$

and its output is contaminated by additive white Gaussian noise N of power 0.5, independent of the input. The input to the plant is also a white Gaussian noise N of power 1. Generate 10,000 samples of both input and contaminated output.

The goal of this problem is to identify H(z) **comparing the performance of the conventional FIR and a linear Gamma filter, both adapted with the LMS algorithm** to identify the unknown plant transfer function. Use the normalized MSE as the quality of the identification (normalize by the power of the input). Start by using a fixed μ, and scan for the best performance. Then adapt also μ as an extra parameter. Select appropriately both the FIR and the Gama filter order. Analyze the filter parameters of the different models and compare with the "unknown plant". Explain what you observe.

Problem II

Redo Problem I with an IIR filter and compare the performance with the Gamma filter above.