EECS 225A Spring 2005

Homework 7

Due: Date March 10. Solutions will be presented on that date and you will self-grade your homework.

Note: In all homework problems you are encouraged to use the numeric and/or symbolic capabilities of Matlab or similar facility.

1. You wish to design a least-squares inverse filter that realizes (or if necessary approximates) \( g(k) \ast h_{\nu}(k) = d(k) \), \( 0 \leq k < M \). However, battery power limitations restrict the value of \( N \) (number of FIR inverse filter coefficients) to \( N = 2 \). You can assume that \( \sum_{k=0}^{\infty} |g(k)|^2 < \infty \). In the context of your application, the accuracy of overall unit-sample response of the cascade of filter plus inverse filter only matters for \( 0 \leq k < M \).
   a. Formulate the equations you would need to solve for \( M = 2 \).
   b. Repeat a. for \( M = 3 \).
   c. Use Matlab to numerically calculate the inverse filter and resulting unit-sample response of the filter cascade for the a. and b. cases. Assume that \( g(k) \) is real-valued and that

\[
g(k) = \begin{cases} 
1/(1+k)^2, & 0 \leq k \leq 10 \\
0, & k > 10 
\end{cases}
\]

2. Hayes problem 5.2

3. Hayes problem 5.3

4. Hayes problem 5.5