ECE 6950 Final Take Home, Due Tuesday, 22 April. by 5 pm

No collaboration or help is allowed on this take-home exam, it must be your own work!

(1) Based on the textbook and in-class solutions for the least-squares problems of sections 11.1, 11.2, and 11.3, provide a detailed solution to prove 11.4 – the weighted regularized least-squares solution and Theorem 11.4.1.

Follow the course note and textbook examples to derive the weight estimate and the minimum cost functions given in Theorem 11.4.1. Note: this is a homework-like problem not MATLAB!

(2) Alternate algorithm based on the Computer Project from Chapter 10.

(a) Dr. Bazuin demonstrated adaptive interference cancellation, similar to noise cancelling headphones, using the partB code modification in PartB_bjb_aug. The simulation used the e-NLMS algorithm. As an algorithm comparison, write another version of this code using the RLS algorithm.

Comment on the significant differences between the e-NLMS and RLS simulations.

(3) Simulation and comparison of e-NLMS with Power Normalization to LMS, e-NLMS and RLS.

Starting with Dr. Bazuin’s code from exam #2 (Ch05partA_LMS_NLMS_RLS_zetaSSbound.m), include the e-NLMS with Power Normalization algorithms in the simulation (p. 227-229). Include steady state error bounds (p. 302-305).

(4) Simulation and comparison of the Leaky-LMS algorithm to LMS, e-NLMS and RLS.

Starting with Dr. Bazuin’s code from exam #2 (Ch05partA_LMS_NLMS_RLS_zetaSSbound.m), include the Leaky LMS algorithms in the simulation (p. 233). Include steady state error bounds (p. 325), which you will have to derive and/or appropriately defined. See problems 9.26 to 9.30. Information may also be derived from the following papers:


For your solutions:

(a) Design, simulate and document in a written report the solution and results.

(b) Provide graphs, equations, figures, and plots that demonstrate that all elements of the problems have been completed.

(c) E-mail the Matlab *.m file code to me. The files must be received AND execute without modification in order to receive credit. It is likely that I will execute your code to verify the results that you submit. Therefore, if non-standard functions are used, send them as well. Non-standard is anything not in the basic matlab package, signal processing toolbox, communications toolbox, or control system toolbox. (Check to see where your functions come from!)