Hi:

Students need to turn in a final MATLAB project for ECE-539/ ECE-595, in lieuof the final exam. This could be one of the following projects:

(1) DMT (digital multitone) systems or AT/T touch-tone standardimplementation. This involves generating a DMT signal for a specifiedtelephone number, modeling channel impairment such as silent periodsor addition of noise, and finally decoding the DMT signal using differentmethods so that a probability of detection error can be computed.

(2) Spatial diversity combining techniques: you will simulate amultiantenna receiver system with a flat Rayleigh/Rician fading channelwith AWGN applied to binary antipodal signalling. You will compare theestimate average symbol error probability with theoretical expressions todemonstrate the improvement in performance when multiple antennas areused.

(3) Speech analysis/synthesis: you will generate artificial vowels using alinear source model. You will then analyze the signal using linearpredictive analysis, spectrograms to confirm the formant centerfrequencies. You will also look at varying pitch effects and varyingglottal pulse models and pre-emphasis effects on the quality of the soundproduced.

(4) Filterbank CDMA/FDMA systems: Combine the signals/audio frommultiple users using filterbank transceivers that are designed forperfect reconstruction to reconstruct the signals for each user at theeceiver end.

(5) Using SVD based subspace signal processing to separate the maternalheart beat signal from the foetal heart-beat signal.

(6) Comparison of active noise cancelation algorithms such as theLMS, RLS, CGA, hybrid LMS/RLS/CGA filters.

(7) Subspace frequency/direction estimation algorithms: you will implement:minimum variance, eigenvector, Pisrenko, min-norm, MUSIC, Bartlett, principalcomponents and a few other algorithms for multiple sinusoidal signals.

(8) Homomorphicdeconvolution: Using cepstral analysis to deconvolvepitch information from vocal tract information in speech production.

(9) Robustness of LTI structures: comparing the direct form, cascade form, parallel form, lattice form implementations for finite precision arithmetic.