EEL 6586: Projects

Final report due Friday, April 28 at midnight. Late reports will suffer the usual late fees and penalties.

The final project consists of a significant portion of the grade in this class. You are strongly encouraged to work in teams of two or three. Important dates are as follows:

- On Friday, March 24 each group will meet with the instructor for 10-15 minutes to discuss the project topics.
- By Friday, March 31, midnight. Each group should email the instructor a description of the proposed project (at least one paragraph in length).
- From that day onward, each Friday until the final day of class, each group should email a description of progress for the week.
- Oral Presentations: Each group will give a short presentation on their accomplishments. We will have presentations the last four days of class: April 17, 19, 21 and 24. (We will not have class on April 26)
- Final project reports are due by email Friday, April 28 at midnight All late penalties will apply.

The final grade for the project will be based on the on-time completion and quality of each of the above items.

Project Report

Your final project report will be a web page–there is no need to print it out. Just email the address to the instructor. Many programs are capable of outputting html code so this should not be a big hassle. An advantage of using a webpage for the report is that you can include color figures and examples of sounds used or produced. If you have never designed a webpage before, this is your opportunity to learn. The report should be written as if it were to be submitted to a conference and contain the following components:

1. A concise description of the problem.
2. A summary of previous solutions to the problem. You should include *at least* one reference to a paper you have read (not a textbook).

3. A detailed description of your solution to the problem. You should clearly state if you have used matlab code or programs that you did not write.

4. Matlab simulation results.

5. A discussion of the significance of these results and how your solution differs from previous attempts.

6. The appendix should contain complete MATLAB codes, messy derivations and any other information too detailed to keep in the main body.

Project Presentation

You will not be graded on how good a speaker you are, but on the work you have done and how well you prepared for the talk. Powerpoint presentations with audio demonstrations are strongly encouraged. Presentations should get better with each day since later students have had more time to prepare. Students presenting earlier will get special brownie points. It is expected that the work described is not completely finished and the presentations only discuss the work completed thus far and future plans.

Required Attendance

Attendance will be taken for the last four lectures of the semester. On April 17, 19, 21 and 24, the students in the class will give final project presentations. There is no class on April 26. You will lose a half letter grade on your project score for each day that you miss. In the highly unlikely event that you have an excuseable absence, please let the instructor know in advance.

Project Topics

You are **strongly** encouraged to come up with your own idea for a project based on your own experience. Extra points for novelty and creativeness. Projects should roughly fall under one of the four major topics in this course: 1) speech synthesis, 2) short-term speech processing, 3) speech recognition, and 4) speech coding but your instructor is willing to consider all proposals. You are expected to work on two or three person projects but one-person projects may be allowed in certain circumstances. Just a few of the possible topics include:

1. Implement a speech synthesis algorithm.

2. More accurate pitch detection or formant estimation procedures.
3. In matlab, implement a speech coder more sophisticated than LPC-10E.
4. Implement a simpler coder to work in real-time between two PCs.
5. Voice warping: to change the pitch or other quality of a speech signal. For example, change a voice signal to sound like Mickey Mouse.
6. Real-time DSP implementation of any of the algorithms related to this class.
7. Noise filtering: clean the noise from a speech signal assuming only a single speaker, loudness or intelligibility enhancement.
8. Use data recorded from several microphones to reduce noise.
9. Audio-based video playback for internet teaching: produce a video of a speaker's face given only audio. This required a training set video.
10. DTW (easy) or HMM (difficult) based speech recognition. Remember that we are completing a simple HMM exercise for HW#4.
11. Investigate various feature detection techniques for phoneme recognition (cepstrum, LPC, mel-scale, reflection coefficients etc.)
12. Speech recognition applied to any particular application (controlling a robot, telephone number lookup, stock reports, etc)
13. Combine adaptive filters or neural networks with any of the themes in the course.
14. An unacceptable project would be to demo a commercial speech recognition program. A better project would be to preprocess the speech to improve the recognition performance of this program.
15. Speaker, gender, or language detection from speech.

You are welcome (as always) to email or talk to the instructor about your project ideas.