

Project List (ECE6255 Spring 2010)

The following three broad categories are suggested for term projects:

1. A literature survey and a report
2. A hardware project
3. A software project

(i) Some suggestions for a literature survey are:

1. Pitch detection method
2. Voiced/unvoiced analysis method
3. Formant analysis method
4. Vocal tract area function analysis method
5. Articulatory modeling of speech
6. Pole-zero analysis of speech
7. Analysis-by-synthesis processing of speech
8. Detection of places and manners of articulation of English sounds
9. Detection of phones in fluent speech
10. Detection of acoustic-phonetic features, e.g. nasals or stops, in fluent speech
11. Modeling of sound sources for speech production
12. Speed-up and slowed-down of speech
13. Helium speech analysis
14. Computer voice response system
15. Speech systems for the disabled
16. Speech systems for the elderly
17. Vector quantization of speech
18. Others

The student should choose a topic and consider the following questions:

1. What is the problem?
2. What is the importance of the problem?
3. What have been the basic approaches?
4. What has already been accomplished in the selected topic?
5. Are new approaches called for?
6. What are the unsolved problems? What needs more work?
7. How to share the work load in a project team?
8. What is a reasonable level of difficulty for 6000 level term projects?

(ii) Hardware Design Project:

1. Design a code converter for PCM to ADPCM
2. Design a circuit to detect tones embedded in speech
3. Design a circuit to detect speech in the presence of noise at about SNR=15dB

4. Design a 4 band speech spectrum analyzer
5. Design a system to display speech spectrogram
6. Design a parallel formant speech synthesizer
7. Design a speech scrambling or encryption device
8. Design a digital pitch detector
9. Design a voiced/unvoiced detector
10. Design a fricative detector
11. Others

The student should choose a topic and consider the following questions:

1. What is the problem?
2. What is the available, in theory and technology, to solve the problem?
3. What are the details of the solution? Depending on the available time, determine what is feasible and work out something at the logic level (if hardware cannot be realized).
4. What are the hardware requirements for system implementation?
5. How do you evaluate or demonstrate the software programs?
6. How to share the work load in a project team?
7. What is a reasonable level of difficulty for 6000 level term projects?
8. If possible, do a cost analysis and chip count for the proposed solution.

(iii) Software Design Project:

1. Design a pitch detector: time domain, autocorrelation, cepstrum, LPC, etc.
2. Design a system to display speech spectrogram
3. Design a parallel formant speech synthesizer
4. Design a speech scrambling or encryption algorithm
5. Design a voiced/unvoiced detector
6. Design a fricative detector
7. Design an endpoint detector (in the presence of noise at about SNR=15dB)
8. Design an LPC speech analysis system – from speech to LPC to spectrum
9. Design a vector quantizer using speech data provided in the class website
10. Others: speaker recognition, speech recognition, voice conversion, etc.

The student should choose a topic and consider the following questions:

1. What is the objective of the project?
2. What is the importance of the problem?
3. What have been the basic approaches, including mathematical descriptions?
4. How do you evaluate or demonstrate the software programs?
5. How to share the work load in a project team?
6. What is a reasonable level of difficulty for 6000 level term projects?