EE121: Project 1

Specification.

Your objective is to build a system that can reliably transmit a file between two laptops, using only audio (speakers and mic) to communicate. The details of how you implement this (synchronization, modulation, error-correction, etc) are left entirely up to you. To test the system, we will provide a file (of size $\sim$ 1KB) and ask you to transfer it in a noisy environment (our classroom).

Your system should be capable of a reasonable transfer speed (at least 100 message-bits per second, although 200 b/s should not be hard, and much higher is certainly possible). The environmental noise may include both talking and occasional clapping (that is, both iid and burst errors).

You are encouraged to research further coding/communication techniques for your project (for example, dial-up modems solved a similar problem over phone lines). However, you should write everything from scratch.

Guidance.

Try to build your project in layers. Start with a modulation scheme that takes advantage of the available bandwidth to achieve fast communication with a reasonable bit-error probability. Then use codes to make this communication reliable.

You may initially assume that both laptops are synchronized (ie, the receiver knows exactly when to start "listening"), but be aware that this will eventually need to be handled. Splitting your transmission into "frames" may help with synchronization issues.

Spend some time initially characterizing the physical layer: what is your usable bandwidth? There may be unexpected nonlinearities in your channel. Tuning your modulation to fit the physical channel can vastly affect performance.

Grading.

Your grade will incorporate:

1. Performance on the in-class test (30 minutes max). This includes setup time (for example, if you want to characterize the response of the room prior to the test).
2. Group presentation (1hr max). The presentation should include details of your system, obstacles you encountered, mysteries unexplained, etc. Be ready to answer questions.
3. Self-reflection (1 page max). Each group member submits a summary of his/her contribution to the project.