

## **Research Advisor & Group**

Dr. Sonwalker is a member of the Educational Media Creation Center (EMCC). As the former head of MIT's Hypermedia Teaching Facility, Dr. Sonwalker has done a great deal of research in the area of technology-assisted and hypermedia based learning. The EMCC is a division of the Action Media Production Services (AMPS) group. The centralized goal of these two groups is to "enable education through enduring technology." The EMCC is involved in researching effective ways to deliver educational solutions that bring together instructional design and core information technology. Technology facilitated learning is an area that continues to evolve with further advancements in technology. The EMCC is devoted to supporting educational technology initiatives.

## **Technology**

The technology involved in this project is fostered in various research groups at MIT. This thesis project will combine various methods of learning with the advancements in mobile technology. The educational component of this project entails effectively incorporating the various styles of learning into the project. These styles include apprenticeship, incidental, inductive, deductive, and discovery. The various learning styles can be accentuated with advancements in technology. Classroom settings and syllabuses have started to change from a teacher-based system to one that is learner-based with the help of online teaching facilities. Additional shifts in education are seen with the increased use of video and animation capabilities.

The highlight the evolving education standards, this research project hopes incorporate the advancements in speech recognition, location detection and mobile technology conducted in the Laboratory for Computer Science (LCS).

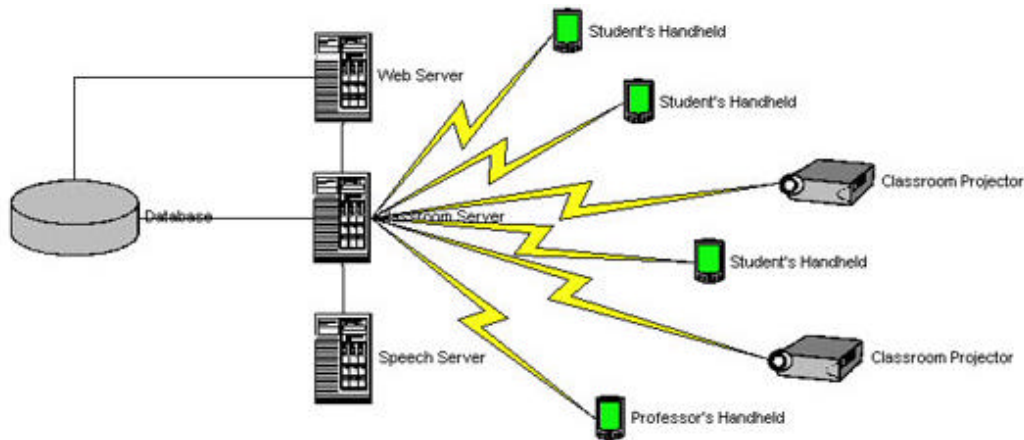
The location technology involves using Crickets, designed and implemented at LCS. The Cricket technology is comprised of beacons and listeners. A cricket beacon is mounted on a ceiling or wall and emits an RF signal and an ultrasonic pulse. Listeners are attached to a mobile device and pick up RF signals and the corresponding ultrasonic pulse to determine its distance from the emitting beacon. Including absolute distance from a particular beacon, this group has defined a software Cricket Compass that can determine the x, y, z coordinates of a given listener. Currently, efforts are being made to increase the accuracy of the Cricket system and allow for the use of multiple Crickets in one area.

Second, this project hopes to incorporate the emerging speech recognition technology being developed at LCS. The speech technology has been developed since 1994, and has revolved around enabling human to computer conversations. The project could interlace to spoken language system called Galaxy. This architecture allows for speech recognition, language understanding, information retrieval, and language generation. The speech technology is targeted to being transported from a server to light weight mobile devices.

### **Project Demonstration**

The focus of the thesis will be to create a Next Generation Mobile Classroom. This project entails creating an interactive and intelligent platform for the next-generation classroom. The project would demonstrate the key technologies of education design, location technology, and speech recognition. In this next-generation classroom, students and professors will carry handheld wireless devices, such as Pocket PCs. This project will take advantage of the latest technology by using it to revolutionize the classroom experience and learning environment.

An example classroom scenario involves a professor entering a lecture hall with a handheld device. The handheld device can be used to monitor her position, so that her lecture slides are automatically displayed on the room's screen. Students of the class also have handheld devices that allow for automatic attendance as they enter the room. In addition, the lecture notes can appear on or be downloaded to their handheld. As the professor continues with her lecture, she can add comments or text that will be reflected on the student version of the lecture notes. Also, her voice can be recording and processed into text for those students with impaired hearing. Adding to the interactive lecture, the professor can gauge her students' understanding of the material by administering a quiz sent directly to everyone's handheld. She can see the results of the quiz immediately, and continue with the lecture accordingly.



In this environment, students and professors will communicate and share information using mobile devices. Based on the education standards of EMCC and AMPS, this situation can enhance the quality of teaching. The project can serve as a prototype of an educational infrastructure that demonstrates a high level of interaction between professors and students. The project can be used as a foundation for future learning applications.

This demonstration will make use of the location technology of the Cricket system, as beacons will be placed in the lecture hall and each handheld will have a listener. The next generation mobile classroom also makes use of the speech recognition technology as an aid to lecturing. Furthermore, this classroom will open doors to new and more efficient styles of teaching and provide a basis for future studies on techniques in education.

### Timeline & Risks

**Spring 2002:** The overall goal for the spring term is to complete the specifications for the design and architecture of the system. The following details about the specifications have been laid out:

- Write a specification of the requirements of the system. This focuses on speaking with professors to outline the features that should be included in the project.
- Write a specification for the architecture. Outline the technical aspects of the project and open communications with project Oxygen, so that the location and speech recognition technologies can be embedded into the project.
- Write a specification for the end-user. This entails working with Dr. Sonwalker and other professors at EMCC and the Center for Advanced Educational Services (CAES) for help with outlining the programmatic structure of the classroom

In addition to outlining the specification for the classroom, the spring term will also involve resource allocation. This includes determining the feasibility of incorporating the different technologies and applying them as effective educational tools. The necessary hardware and software tools, including iPads, servers, and crickets also need to be obtained. In the spring, this group also hopes to acquire another MEng student to work on developing the classroom, since it is quite a comprehensive project.

**Summer 2002/Fall 2002:** During the summer and fall of next year, the classroom will be developed. This includes the software development and integration of technologies. The development includes setting up the servers, defining a local naming system for the resources and handheld devices in the system. Once a preliminary version is developed, the rest of the fall term will be spent testing and fixing bugs. During the fall term, professors and students will be asked to test out the system to provide usability feedback.

**IAP 2003:** During IAP, we hope to deploy a "beta" version of the next generation classroom experience. This involves setting up the test class situation and distributing resources to professors and students. Using the prototype over IAP will provide a small-scale test situation of the classroom, which gives us more control to monitor the situation. We can use this test case as a means of fixing bugs and collecting feedback from lecturers and students. IAP will also give us time to train the users of the system and highlight the features.

**Spring 2003:** During the spring I will spend most of my time writing up my thesis paper. Early in the term I will work to incorporate the feedback from IAP into the system. The outcome of my research paper will hopefully help guide future endeavors of education with emerging technology.

A large risk with this project is funding. Currently we are working to receive funding for the project and I will find out before the end of the term if this has been acquired. Otherwise, my advisor suggested that I approach Project Oxygen with these ideas in hopes that they will help fund and support the project. Second, creating a prototype of a next generation mobile classroom would be difficult to complete in one year. So my group hopes to employ a UROP in the next year for this project and perhaps another MEng student.