



Sensor Consortium: Consortium for Security and Medical Systems
Department of Electrical and Computer Engineering
College of Engineering and Applied Sciences, SUNY Stony Brook

Newsletter, March 2005

In this newsletter we are reporting the news that occurred since January 2005.

Educational Component

1. Administrative

a) Consortium staff lunch meeting

The meeting took place on February 15 with the following agenda:

1. Report on the Consortium activities during the fall semester
2. Plan for the next semester and beyond.
3. Feedback and assessment.

The meeting was attended by 11 people: project advisors from the ECE Department of SUNY SB, representatives from all Educational Partners, and the Consortium Administrator.

Each project advisor described their project and the changes and development from the day of inception to the date of the meeting. Prof. Alex Doli reported the switch of his major emphasis from technology to business. Prof. Ridha Kamoua reported significant changes in the orientation of the project. The Sleep Center at the Stony Brook Hospital expressed some interest in the apnea detector, so that instead of asthma sensor for children their group is working on the apnea detector. Prof. Wendy Tang also reported a change of major theme of her project. The original project was to develop Wireless systems for perimeter security. However, after market analysis, it was determined that the perimeter security market is quite mature. Instead, their group decided to develop a remote health monitoring system. Several Assisted Living Centers on Long Island were contacted and had expressed interests in the project.

Most important event in the spring semester is the Annual Conference. We have considered the date for the Conference, either a couple of weeks before, or after final exams. This question should be further taken up with the E-team students. After the discussion of the requirements for E-team finals the following criteria were established: i) presentation at the Conference; ii) Project report/Business Plan; and iii) a grade from the Project Advisor.

Prof. Joseph Betz (Farmingdale) suggested that the E-team students should make presentations of their projects at their home institutions. This will attract new undergraduates to the Consortium activity and helps the selection of the best students for next year E-Teams.

In the Feedback and assessment section we considered what types of questionnaires should be designed to solicit feedback from all people involved in the Consortium activities (see Outreach and Dissemination section of this report).

At the closing of the meeting we discussed selection of new guest speakers. The following names were suggested: Dean Kamen of DEKA Research & Development Corp, residents of the Long Island Incubator, Pat Malone and Matt Grossing from LIA.

b) New member of the Consortium staff.

Dr. Michael Gouzman, the University Instructional Specialist at the ECE Department of SUNY SB, has joined Prof. Wendy Tang as a co-advisor for the *Wireless Health Monitoring System* project.

2. Projects development

In this section a short news report for each project is given.

Project *RFID Sensor Networks*; Advisors: Profs. Petar Djuric and Mónica Bugallo.

Since the beginning of the semester several important advances have been made. We have completed experiments where a transmitted signal by a reader is backscattered by a tag and then captured by a sensor. This experiment showed the feasibility of the proposed system. We have designed a protocol of the proposed system, which is a combination of the Matrix protocol (for tag singulation) and CDMA-type signaling from the sensor to the reader. The designs of the power supply and the analog front-end of the tag have also been completed.

The undergraduate students involved in the project have continued to make progress with their work. One of them has prepared a SIMULINK model for the overall system, which can be used to study the characteristics of the system. Another student has written a MATLAB-based GUI for testing methods for tag localization. Finally, a third student is completing the simulation of the Matrix protocol. Upon successful completion of the simulation this student will simulate our protocol.

Project *ANGEL: embedded platform for improving on-campus security*; Advisor: Prof. Alex Doboli

During the past two months our E-team (*E-telligent*) continued working on the various elements of implementation and marketing of the embedded system designed to help a visually impaired individual navigate a campus environment. The hardware and software elements of *E-telligent* project are currently being integrated into the embedded system. Thus far, we have written drivers and successfully integrated a LCD screen, a speaker with a speech synthesizer, and a digital compass. The group is still in the process of incorporating a GPS device and a sonar sensor. The final hardware task of the group will be incorporating a user-friendly interface for the device. In the software field, the group is enthusiastically working on writing a digital map program for the device. The final software undertaking will be to write a driver program that will encompass all lower level software components.

Concurrently the group has been prudently working on the business component of the project as well. Within the business element the group has been conducting personal interviews with visually impaired individuals to get their suggestions and feedback for such a device. These interviews will also aide the group to market the proposed product. A final business mission will be to compose a user manual. A final paper on the project, which may include a business plan is also in the work ahead. *E-telligent* is looking forward to successfully completing the project

before the Sensor Consortium year-end competition, and they are excited to demonstrate the devices abilities there.

Project *Wireless Biopotential Recording for the Treatment of Sleep Apnea Disorders*, Advisor: Prof. Ridha Kamoua

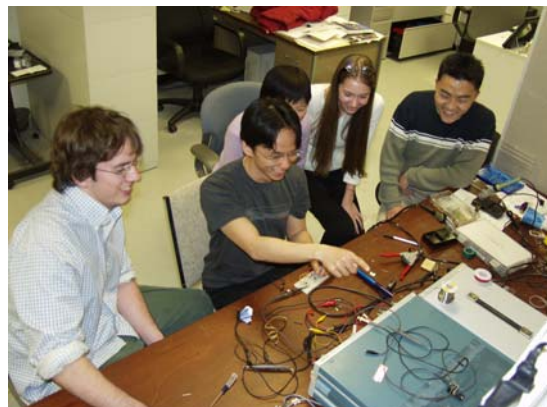
Sleep apnea is very common disorder that affects more than twelve million Americans. It is a breathing disorder characterized by brief interruptions of breathing during sleep. Risk factors include being male, overweight, and over the age of forty. Current approaches for the diagnosis of sleep apnea include recording and tracking the body surface potential associated with brain waves (EEG), eye movements (EOG), muscle tone (EMG), and heart rate (ECG). The diagnosis system consists of metal electrodes attached to the patient and connected with wires to external electronics for signal amplification, filtering, and processing. Such a system limits the free movement and comfort level of the patient. The goal of this project is to develop a wireless sensor system capable of recording from a large number of electrodes that map the body's biopotentials, monitor users' vital signs (temperature, pulse rate, and blood oxygen level) and notify relatives and medical personnel of their location during life threatening situations. So far, after a lot of research, we selected products from Crossbow Technology (motes and sensors). The main function of this equipment is to read the data from electrodes and store the data in the data logger of the motes and then radio-transmit the data to the base station that in turn will transfer the data from the interface board to the computer and, if necessary, to the Internet.

Project *Wireless Health Monitoring System*; Advisors: Prof. Wendy Tang and Dr. Michael Gouzman

We have identified Crossbow Technology's MICA 2 sensor board and data acquisition boards as our development platform. As a first step, we have tested the National Semiconductor LM34 Precision Fahrenheit Temperature Sensor. However, we found that the LM34's operating voltage and precision level are not desirable. Based on that experience, we have now identified National Semiconductor's LM92 as our choice of temperature sensor. Regarding the measurements of pulse rate and blood oxygen level, we have also identified Nonin Medical, Inc's integrated pulse oxymetry device as our choice. These devices are currently on order and we plan to start our implementation phase once these devices are available.



Prof. Tang and Dr. Gouzman with their E-Team students Guofeng Hou, Amy Kesluk and Matt Kane.



Working in the lab on the project

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Research and Technology Transfer

- The *E-telligent* E-team students have contacted the Guidedog Foundation for the Blind (www.guidedog.org) to inform them about the product the group has been developing. They spoke with the CEO and the Executive Officer for Program Services and now are setting a meeting date so that the foundation officers can meet the group and see the prototype.
- The E-team working on the *Wireless Biopotential Recording for the Treatment of Sleep Apnea Disorders* project has contacted the Sleep Center in the Hospital at Stony Brook. The Sleep Center was enthusiastic about the wireless Biopotential Recording system and provided the wired system they currently use with their patients as a criterion for comparison.
- The Wireless Health Monitoring System project has contacted several Assisted Living Centers on Long Island. A more concrete plan of using those facilities as testbeds is in the work.

Outreach and Dissemination:

1. Consortium Seminar series.



During the seminar: questions and answer session

As a part of the Outreach and Dissemination activity, the Consortium Seminar series goes on. On February 11 the Consortium invited Mr. John Z. Rigos, the Managing Member of Five Points Partners, to give a seminar entitled "Timing and the Entrepreneur: Lessons from Some Personal Experiences", about the ups and downs of the business life and importance of being conscious of time and current business atmosphere. The seminar was a great success and was followed by a lively questions and answer session.

2. Consortium activities survey

As a part of the internal assessment process, the Consortium staff initiated a survey of opinions of various groups about the Consortium activities. Separate questionnaires were developed for E-Team Students, for seminar series attendees and for the Consortium Partners. All the questionnaires were emailed to the survey targets. The results of the survey are still being processed, but several conclusions can already be made. Responses of both E-Team students and seminar series attendees are both positive and constructive. The questionnaires for the Consortium Partners were emailed to the Educational and Industrial partners. While the Educational partners were cognizant of the Consortium activities and approved them, the industrial partners' response indicated that they were not well aware of the Consortium activities.

3. Formation of the Consortium Advisory Board

To correct the communication flaw with the industrial partners, the Consortium is in the process of establishing the Advisory Board from local entrepreneurs and media people. The main charter of the board is to be the judging panel of the competition. The board will also provide advice on increasing publicity, establishing ties with Long Island Industries, and setting the competition guidelines.

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