

# **Software Technologies for Wireless Communication and Multimedia MIT2000-10**

**Progress Report: January 1, 2001—June 30, 2001**

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## **Project Overview**

This project is developing flexible and adaptive communications and computation systems that adapt easily to user and application requirements, which may not be known at design time, as well as to dynamically changing communication channel conditions.

## **Progress Through June 2001**

Over the last six months we have changed the focus of this project from SpectrumWare, with an emphasis on software radios, to ORNet, with an emphasis on medical instrumentation, computation, and communication, as described in our recent proposal to NTT, *ORNET: A Network for the Operating Room of the Future*.

We have devoted considerable effort to establishing collaborative links with clinicians. We are working closely now with several physicians at the Center for Innovation of Medicine and Innovative Technology (CIMIT, [www.cimit.org](http://www.cimit.org)). Recently we have also begun to collaborate with clinicians at Children's Hospital.

Our main technical accomplishment has been the design of a communications infrastructure linking medical sensors and actuators. The architecture builds on work done previously on two NTT-sponsored projects, SpectrumWare and Wind. We wrote a design document, and a prototype implementation is now nearly complete. We have already constructed demonstrations of parts of the system, and we expect to have an integrated demonstration running this fall.

We have also been developing SpectrumWare-like medical sensors in which all of the signal processing is done in software. To this end we acquired and disassembled a sophisticated electronic stethoscope. We separated the sensor from the rest of the stethoscope, and we have begun to reverse engineer the hardware used to process the signals generated by the sensor. This has proved more difficult than we had expected, but we are making steady progress.

We also built a drug infusion pump that can be controlled over a network. We started with a commercial pump and replaced the manual controls by a network interface. We then built a GUI that can be used to monitor the state of the pump and control its behavior.

## **Research Plan for the Next Six Months**

Our primary goal is to build a prototype system that can serve as a proof of concept for our approach to building integrated medical systems using conventional computing and networking hardware. More specifically we plan to do the following:

- 1) Build a board that can be used to connect medical sensors wirelessly to a LAN. The board will have a flexible interface to the sensors, an A/D converter, and a Bluetooth connection to ORNet gateways.
- 2) Connect at least two different kinds of sensors to our network. Most likely these will be a stethoscope and an EKG or EEG.
- 3) Complete the implementation of our network infrastructure.
- 4) Demonstrate the advantages of our approach by building one sophisticated medical application. This is likely to involve a novel approach, using software-based signal processing, to the early detection of the onset of epileptic seizures in children.