A Survey of Underwater Sensor Networks for Water Quality Monitoring
CSE237D Sp08 Project Proposal
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Abstract — Wireless sensor networks (WSNs) have been grown rapidly in the past few years. Lots of researches are done on WSN communications, WSN power conservation, WSN routing algorithms, etc. However, these researches mainly focus on terrestrial sensor networks. Researches on underwater sensor networks are limited. It’s very important to conduct research on underwater sensor networks because they can benefit many areas of science and industry such as water quality monitoring, ocean graphic data collection, disaster detection and prevention, oilfield monitoring, etc.

Project description
This project consists of two parts (a survey and a simulation demonstration). The first part is a research survey that investigates the following aspects of underwater sensor networks:

1. Underwater sensor network characteristics. Underwater sensor networks have different characteristics compared to terrestrial sensor networks. A comparison is conducted between underwater sensor networks and terrestrial sensor networks on deployment, power consumption, cost, communication and mobility.
2. Water quality sensors. Investigate different types of water quality sensors that are available in today’s market and analyze their unique characteristics.
3. Underwater communication. Investigates the current communication methods that are used in sensor networks; analyze the underwater communication requirements and find the suitable communication method for underwater sensor networks.
4. MAC protocol. Review recent work in underwater MAC protocols and discuss the challenges in underwater MAC protocol design such as how to address the large propagation delay in underwater sensor networks.
5. Power efficiency. Discuss how to consume power in underwater sensor networks.

The second part of this project is a demonstration. A SBE39 underwater temperature sensor and an Intel XScale PXA270 board are used in the demonstration. The demonstration will show the PXA270 board communicates with the SBE39 sensor and retrieves both real-time temperature data and historical temperature data that is stored in the sensor’s flash memory. The PXA270 board will be installed and run Windows Embedded CE V6.0 OS and the sensor application will be written in C++ or C#. The temperature samples read from the sensor will be displayed on a 3.5 TFT LCD that is equipped with the PXA270 board. If the time allows I would like to setup a pair of RS232 radios or Ethernet radios and send the real-time temperature data from the PXA270 board to a Windows XP Laptop (which simulates a super-node) through the peer-to-peer radio link. The following figure shows the demonstration diagram.
Challenges of the project

1. Compile and install Windows Embedded CE V6.0 run-time image on the PXA270 board.
2. Interface to the temperature sensor via RS232 port.
3. Make the radio work with the PXA270 board and make the peer-to-peer radio link work.

References