proposal

Demo Abstract: A Weather Station for SensorScope

G. Barrenetxea (EPFL), H. Dubois-Ferriere (EPFL), Roger Meier (Shockfish), John Selker (Oregon State University).

The SensorScope project is a collaboration between environmental scientists and hardware/software engineers at EPFL. It will consist of two large-scale outdoor sensor networking deployments, the first on the EPFL campus, and the second on an alpine glacier. The aim of these deployments is to measure key environmental quantities at high spatial resolution, for the purpose of modeling and understanding energy exchanges and balances at the earth/atmosphere boundary.

This goal of this demo is to show SWeaS (the SensorScope Weather Station), a complete weather sensing unit that we have developed for this project. SWeaS is the core component of SensorScope and will be installed at over one hundred locations in each of the two deployments. In comparison to previous weather boards designed for mote-class nodes, the design of SWeaS considers the entire chain of requirements for a scientific atmospheric measurement campaign, including packaging, energy autonomy, sensor placement, and a diverse set of sensors.

The unit is centered around a TinyNode module, consisting of a TI MSP430 microcontroller running TinyOS, and a Xemics XE1205 radio. Around this core module, we have designed a solar energy subsystem, giving each station energy autonomy, a sensor interface board accommodating 7 external sensors, an aluminium skeleton, and weatherproof housing.

The sensors are:
- Solar radiation sensor (Davis 6450)
- Infrared surface temperature (Zytemp TN0am)
- Anemometer measuring wind speed and direction (Davis)
- Temperature and Humidity sensor (Sensirion SHT75)
- Soil moisture probe (Echo)
- Tipping bucket rain gauge (Davis)
- Soil pressure point with moisture point (Irrometer)

These seven sensors amount to 9 distinct data inputs. Some sensors have digital interfaces, some are analog signals that can be sampled as voltages, and others generate pulses (e.g tipping bucket) that generate microcontroller interrupts. The software drivers for each of these sensors has been developped in TinyOS.

All sensors must of course reside outside the weatherproof housing which contains the core module, solar energy board, and interface board. Each also has unique placement requirements. For example, the surface temperature sensor must point at the ground, and the anemometer must be clear of any wind shadow from the aluminum skeleton.

The demo will consist of a complete SWeaS station with all hardware described above, transmitting sensor readings back to a basestation for display on a PC. An accompanying poster will motivate the choice of sensors, and overview our packaging solution, hardware designs (interface board and energy board), and software (sensor and energy board drivers).