theWeather.system 12/10/2012

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Project Overview:

The system is meant to be placed outside, on the dock, of Boston University’s DeWolfe Boathouse as a weather station. The measurements taken should be at minimum Humidity and temperature. If time allows wind speed and sun-exposure should also be measured. The system should be stand-alone, powered by a solar panel and backup battery. The backup battery is charged during the day if the sun is out and must be able to withstand a sunlight drought of up to one week. The method of communication with the device is through wireless transmission to a hub located in the boathouse coaching hallway, which is connected to a computer that will post current conditions to a website viewable on a web browser. The end goal is to create an iOS application that fetches data from the website and displays that information.

Planned Hardware and Implementation:

The system will use an Atmega324PA to collect data from a PCB temperature monitor as well as a thermistor and a humidity sensor. The humidity sensor outputs linear voltage and is made by Honeywell Electronics, the thermistor is N-type and is scaled down with a voltage divider into an ADC pin and, in the first REV, two PCB monitors will be implemented: TI’s LM95071 and Analog Devices AD7476, both of which communicate over SPI. Readings will be taken in every twenty minutes and stored in EEPROM. One day will be cataloged in memory as well as data from the last year. The data required is average high for the day and average low for the night. This data will be used to map the seasons. The megaAVR also has a RTC being driven by a backup battery when the circuit is not on. The RTC will periodically wake up from sleep, check the time and date on the RTC, take measurements, store the measurements and then go back to sleep in order to save power. The RTC is Microchip’s MCP79410, which communicates over I2C.

Also onboard will be an ATtiny84A which is responsible for regulating voltage between the battery and solar panel. If possible, the ATmega324PA will be replaced by just one ATtiny84A to save space. Therefore, in the first implementation/rev there will be a parallel ATtiny to test SPI, I2C and thermistor data acquisition. If the ATtiny is comparable to the ATmega the ATmega will be scrapped and the ATtiny will be implemented.

The wireless chips to be used are RF transmittors that can send data one half mile to a parallel chip. The chip will feed into a BeagleBone or RasberryPi, preferably BeagleBone, which will then post the data to the web.