

Environment Monitor System

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Lab Overview

- ASSERT (Advanced WireleSS Environment Research Testbed) is the lab's main project [bottom right]
- The system is composed of several small computers
- The computers are connected by coaxial cables to simulate a wireless network
- Faraday cages keep interference out of the system
- Now each lab member works on their own project, with some collaboration with each other
- Dr. Ryan Burchfield is working on a golf club that records player movements [top right]
- The Environment Monitor System is based on the same sensor board design used in Dr. Burchfield's golf club, with some modifications



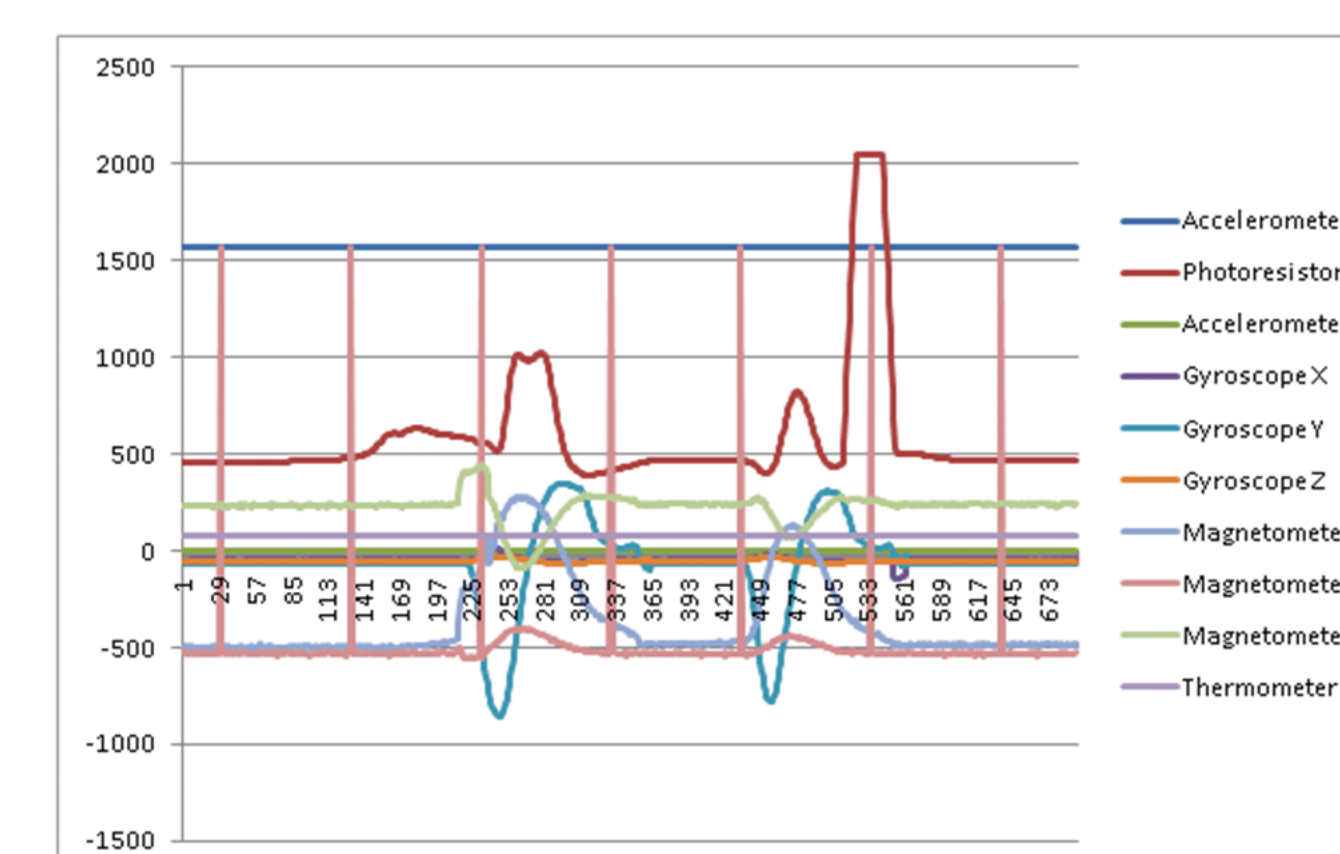
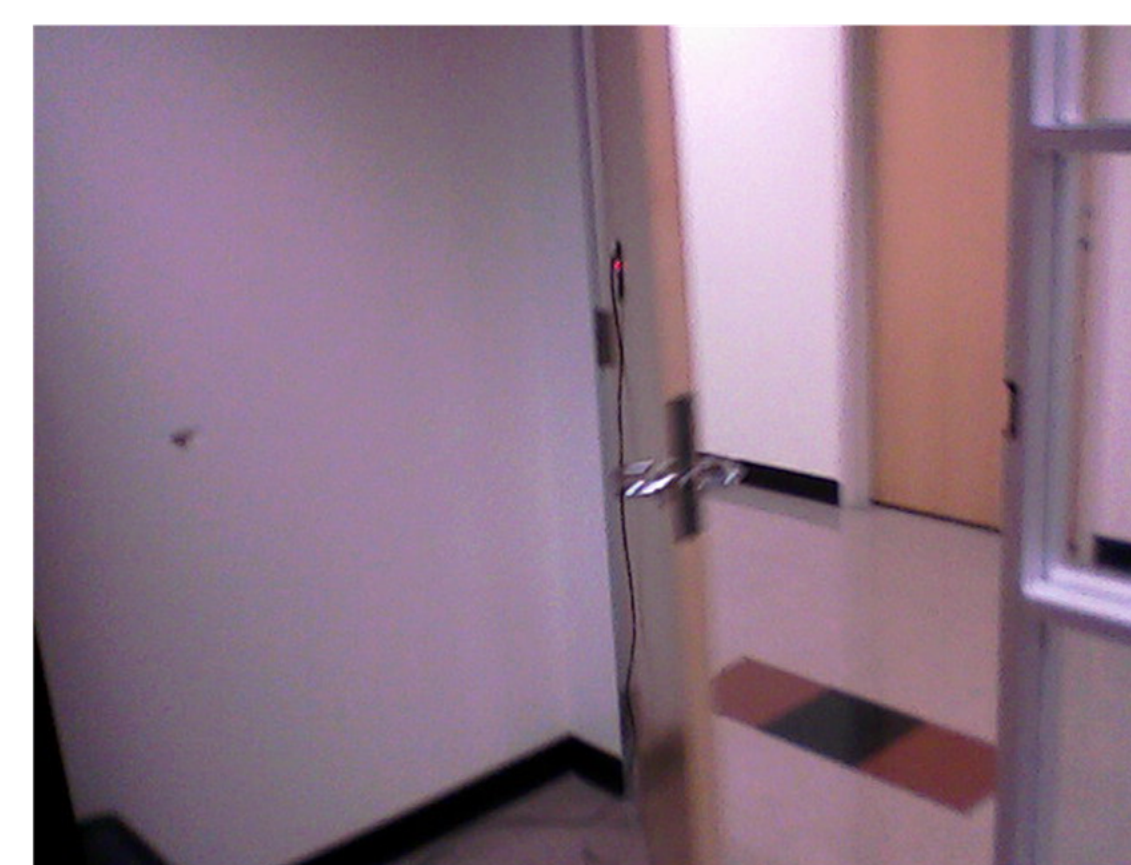
System Overview

The thermometer on the system allows people to know remotely if the room temperature is at safe levels for equipment or materials that may be inside, and to take action if there's an air conditioning malfunction.

The photoresistor on the system aids with knowing if there are people in the room.

The motion sensors on the door detect when it's opened, as to know if people have entered the room, while the magnetometer detects whether the handle has been moved, thus informing whether the door was opened from inside or outside.

Door Motion System Diagram



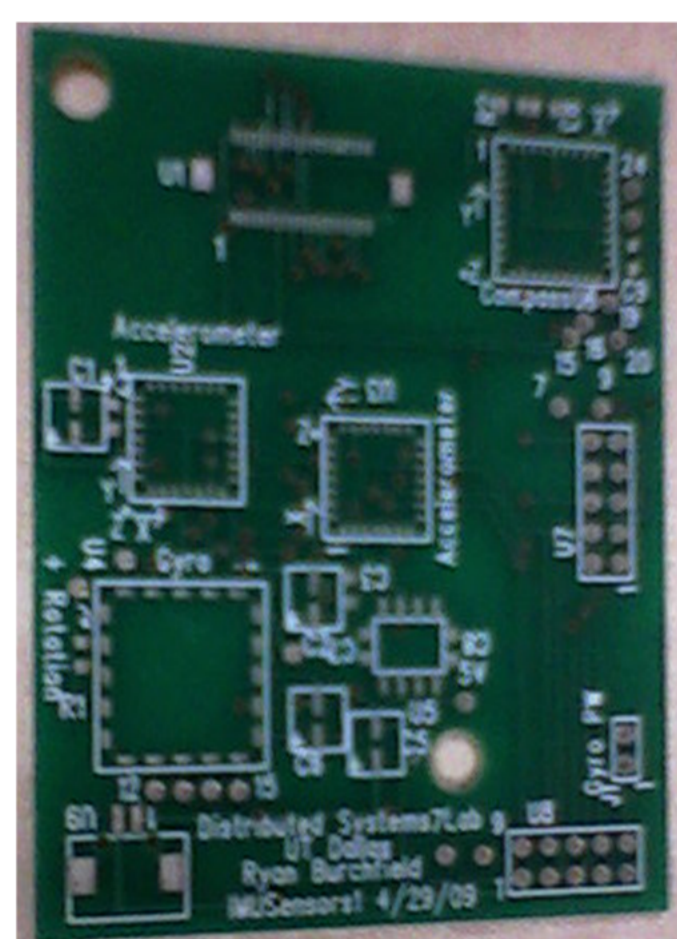
Dataset

- XYZ acceleration data
- XYZ rotation data
- Photoresistor data
- XYZ magnetometer data
- Samples collected over one week span
- Overnight stability testing
- Immediate program debugging during live door testing

Data Acquisition

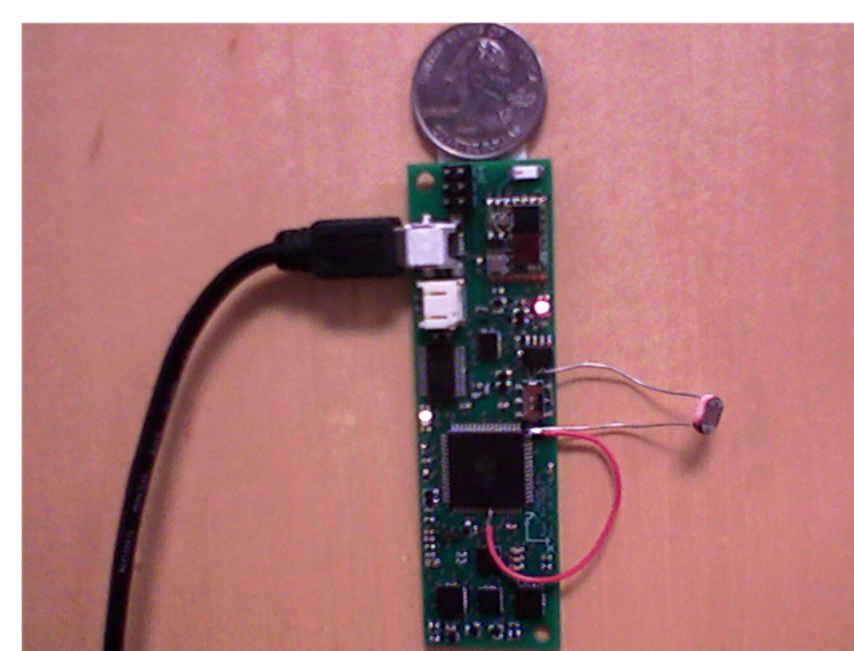
Sensor Board Components

- Tri-axial magnetometer
- Dual rate gyroscopes for tri-axial coverage at +/- 100 degrees per second
- Thermometer
- Photoresistor
- Bluetooth transceiver
- Battery charger
- USB connection for debugging and recharging



Configuration

- 24Hz sample rate
- XYZ magnetometer
- XYZ gyroscope
- Photoresistor
- Thermometer



Classification

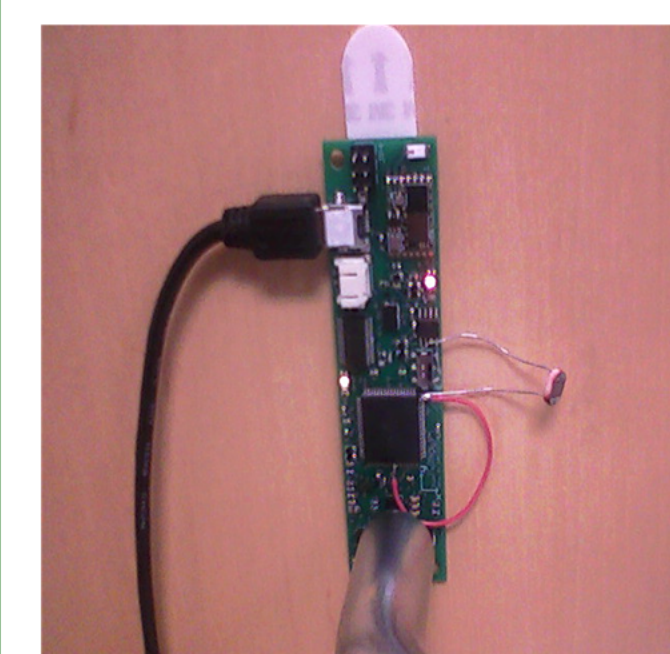
- Thresholds determined by graphing sensor output in Excel
- Events usually show up as spikes in the graphs

Future Work

- Ultra-Reliable wireless operation

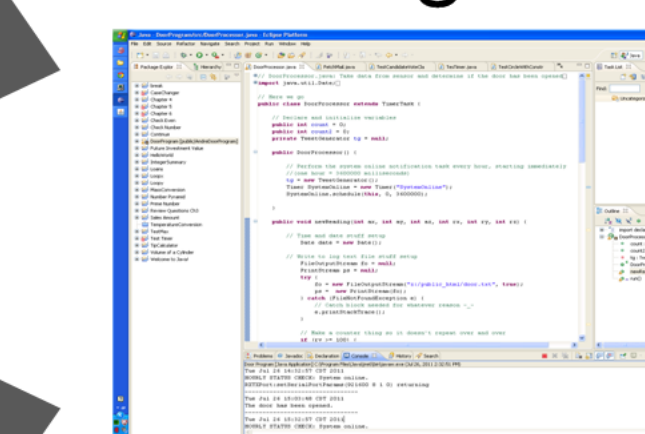
Thermometer and Photoresistor System Diagram

Sensor Board



Signals

DoorProgram.java



Signals

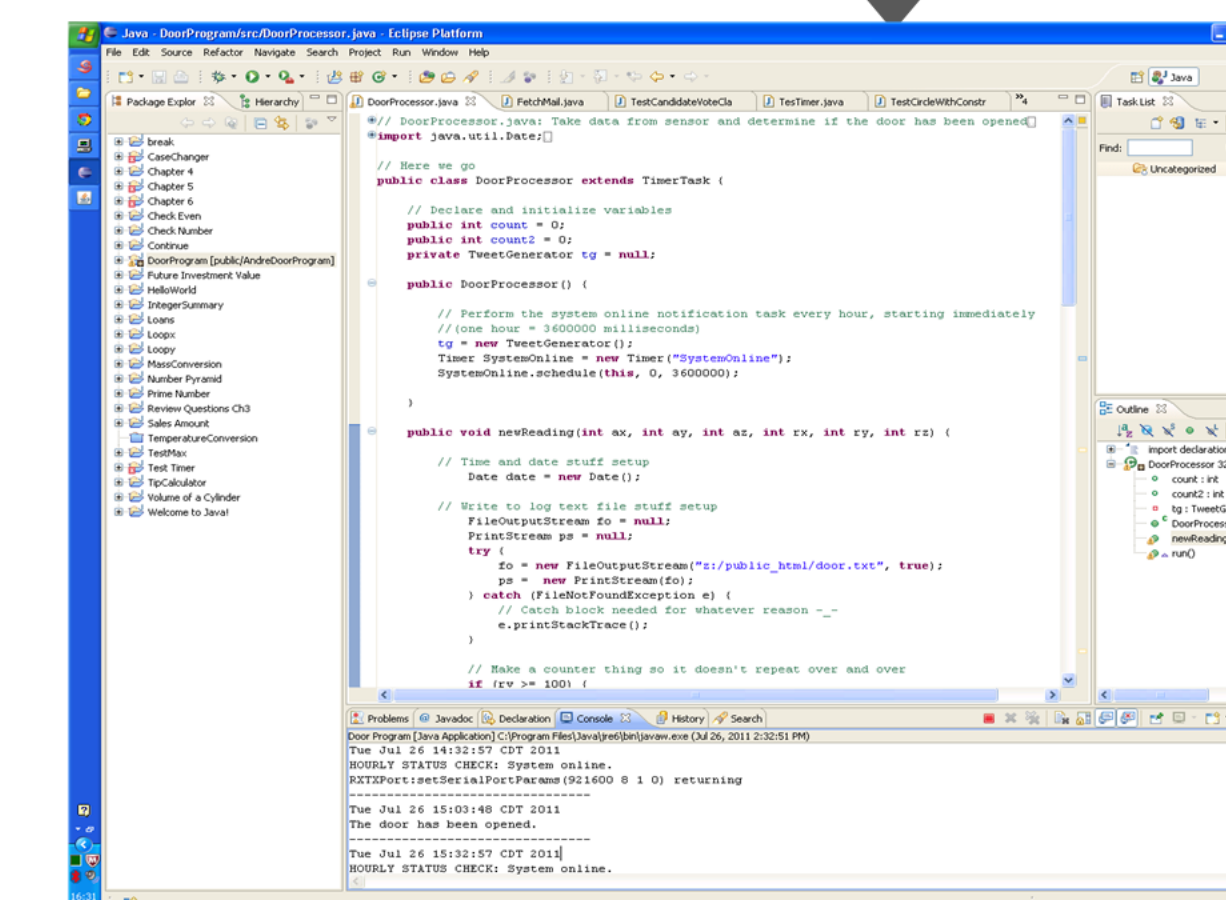
Thermometer temperature is adjusted by -2°F and also converted to Celsius for every event. Light level changes display that the light has been turned on or off. Both light status and temperature are displayed at every hourly system check and door opening event.



Door Program [Java Application] C:\Program Files\Java\jdk1.6.0_25\bin\javaw.exe (Aug 6, 2011 10:31:26 AM)
Mon Aug 08 14:50:03 CDT 2011
The door has been opened from inside.
The room temperature is 72.0°F (22.0°C)
Lights are on.

Mon Aug 08 14:52:17 CDT 2011
The door has been opened from outside.
Temperature is 73.0°F (22.0°C)
Lights are on.

- We look at Y gyroscope and Z magnetometer
- We look for values above 50 or below -100 for door motion
- If Z magnetometer detects handle movement, the door is declared to have been opened from the inside



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