Project Documentation 1

Embedded Linux

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Project Description

Develop a system that can monitor temperature at different depths in a lake at regular intervals. The system should archive the data locally if no network connection is available. If a network connection is available, transmit the data to a central repository. Develop a web interface that can display the data collected at the central repository.

Project Goals

Construct a buoy that records temperature sensor readings at specified levels. It should be able raise and lower a sensor along an anchored wire and stop at specified intervals. The buoy should remain afloat and the inside should remain waterproof.

Implementation

There were originally two ideas for doing this, one with a winch and one without. We decided to go with the winch. The idea is to have a wire hang down with an attached anchor, then the temperature sensor connected to another wire would go up and down the main wire. The main wire is only used to guide the moving wire. Figure 1 shows how this is intended to be set up.
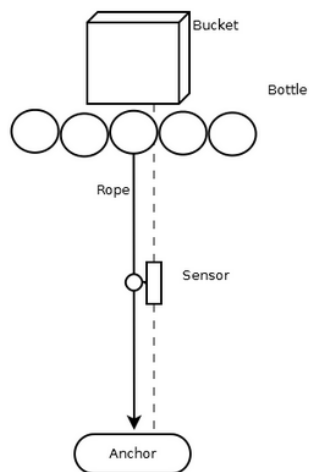

Figure 1. Diagram of the Buoy

There will be a bucket which contains the Pi and the motor. Empty plastic containers such as Soda Bottles will be wrapped around the bucket to keep it afloat. On the bottom of the bucket there will be a rope attached to an anchor as a guide, then the sensor will slide up and down that wire. The sensor will slide up and down by the use of the motor. Power will be supplied by a combination of batteries and a solar panel as in Figure 2.
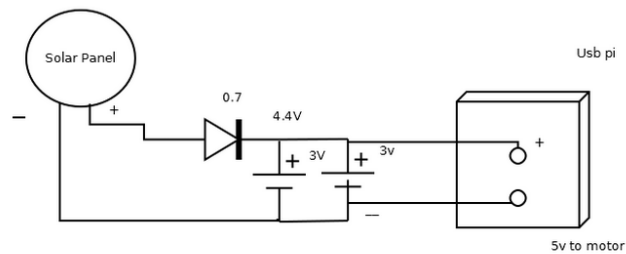
Figure 2. Power Supply for the Pi – 1ˢᵗ version

On the programming aspect of it, a program will be written that saves the data into database, after can be easily export into a file format, probably a csv or similar file. In the future it would be beneficial to add wireless functionality to transmit the data to a server, but there are currently limitations on this.

Components

- Raspberry Pi
- Temperature Sensor
- Bucket / Container (Weatherproof)
- Motor
- Breadboard, wiring, etc.
- Batteries and Solar Panel
- Rope and Anchor
- O-Ring to guide the sensor
- Floating structure

Review

Since there were a couple different design ideas between us in the group, it took a while to get a final plan on exactly how it would be built. But, since our group is academically diverse, each member brings something to the table. This made it easier when it came to things like powering the Pi. Most of the time was spent planning out the details on the build of the project, making it easier to implement. Collecting materials was made easy by utilizing items that are easily in reach such as Soda Bottles or Solar Panels and wiring from Resnick. The only things that took some time were those that we had to buy online or in store such as the bucket, wire, and spool.

Future Goals

In the future we want to be able to expand the sensor capabilities to add in pH sensors and others. Also, it would be beneficial to be able to transmit the data wirelessly instead of having to reel in the buoy from the pond each time.