

Arduino Controlled Garden Monitor

Danny Strawbridge
CPET 491 Senior Design II
Professor Lin
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Purpose

- The primary purpose of the Arduino Controlled Garden Monitor is to create a device that is able to utilize 3 external sensors that measure the basic growing conditions for a garden application
- Measure soil moisture level, ambient temperature, light level

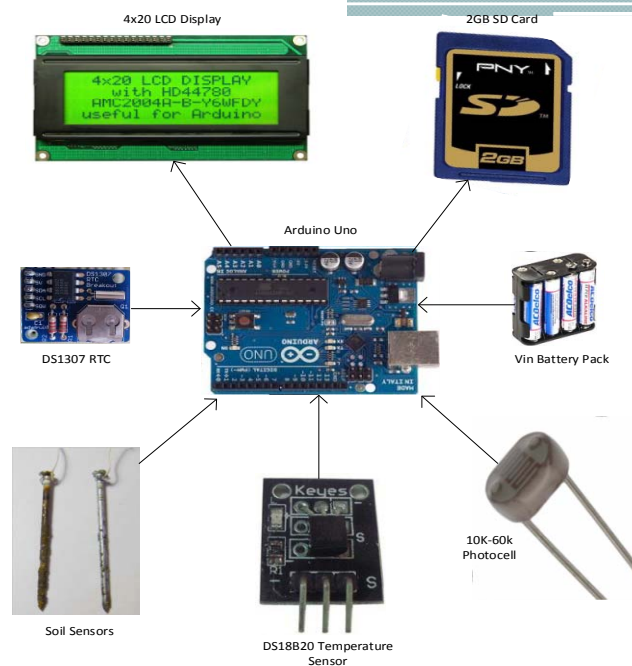
Why I chose this project

- Interest in home gardening
- Fresh picked, free food
- Easier problem solving
- Pest/Disease prevention

Deliverables

- Prototype
- Presentation
- Report

System

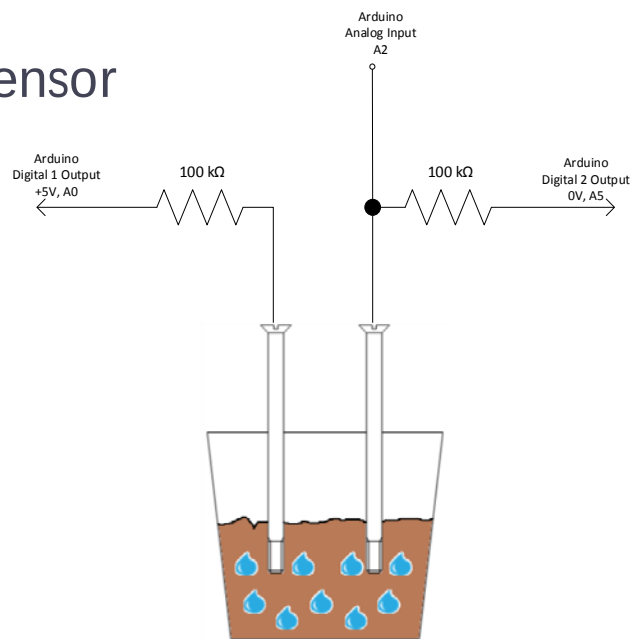


Arduino Uno

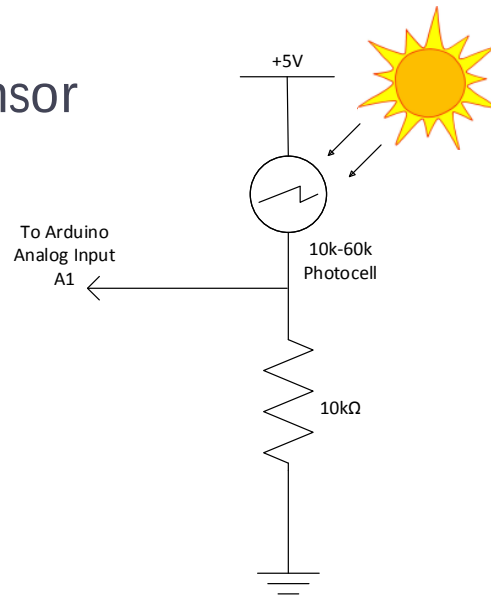
- ATmega328 Microcontroller
- 14 Digital I/O Pins
- 6 Analog Inputs
- USB Capabilities
- Open Source



Soil Sensor



Light Sensor

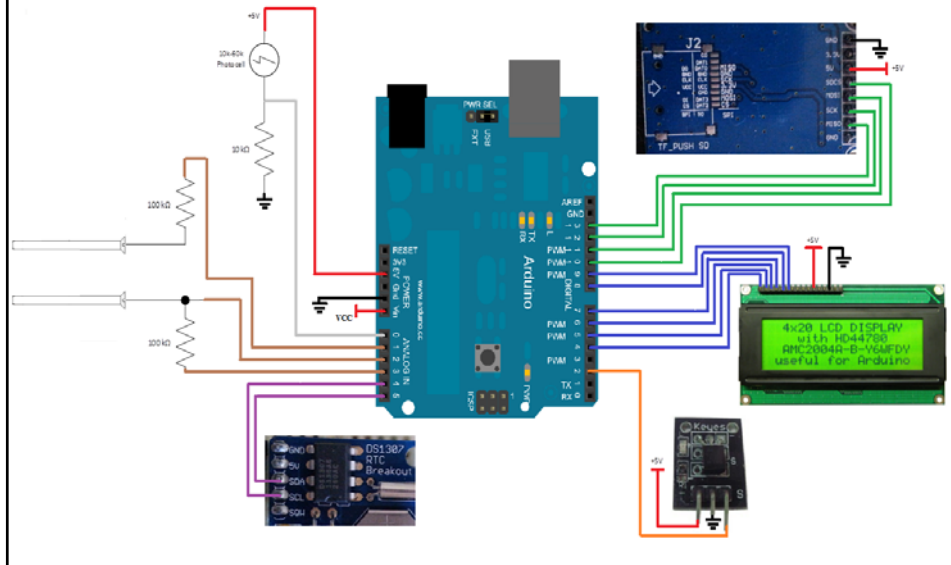


Temperature Sensor

- Dallas DS18B20
- GND
- +5V
- Data Line



System Design



Software Design

- Arduino IDE
- C programming language
- File extension .ino
- Open Source libraries

```

total_trial_test | Arduino 1.0.6
File Edit Sketch Tools Help

total_trial_test
#include <SD.h>
#include <OneWire.h>
#include <DallasTemperature.h>
#include <LiquidCrystal.h>
#include <Wire.h>
#include "RTClib.h"

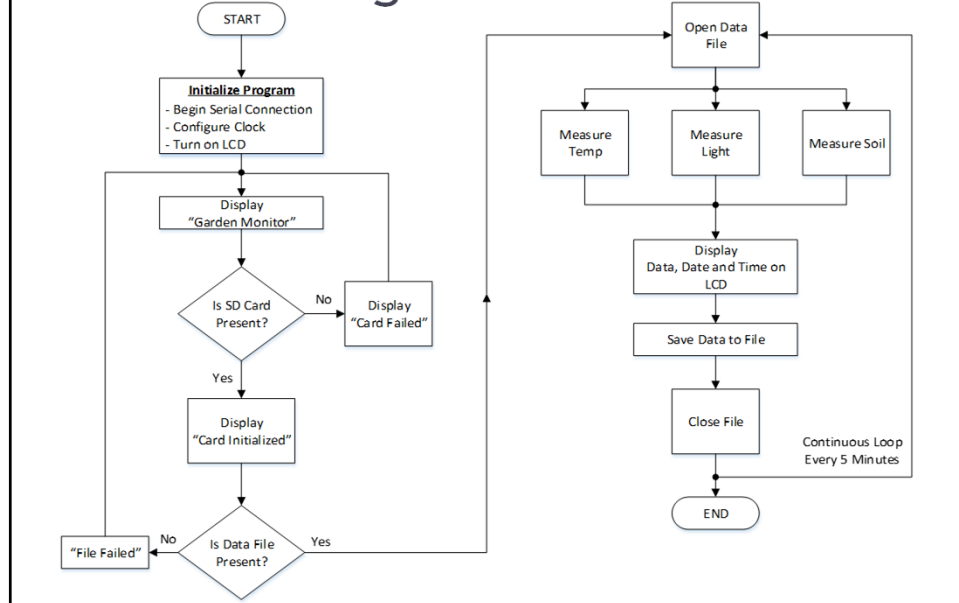
/*
MISO Pin -> 12
SCK Pin -> 13
MOSI Pin -> 11
SDCS Pin -> 10

Temp Sensor
Right -> 2
Center -> 5V
Left -> GND

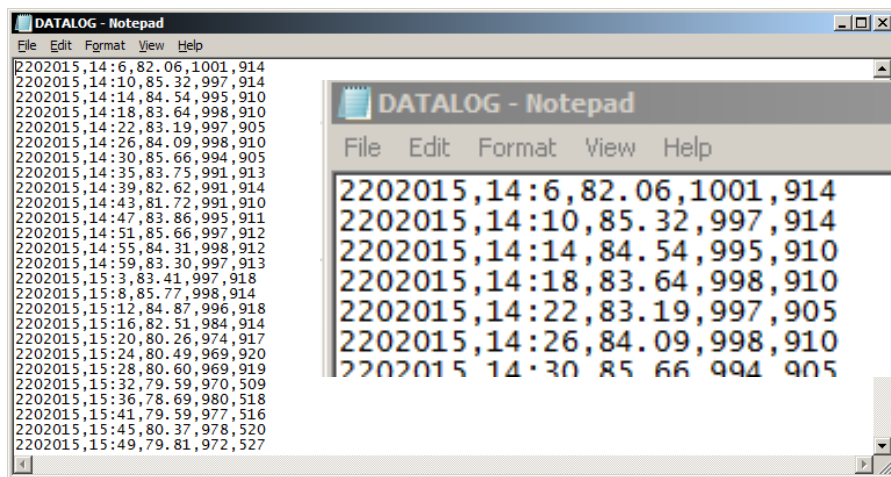
RTC
SCL -> A5

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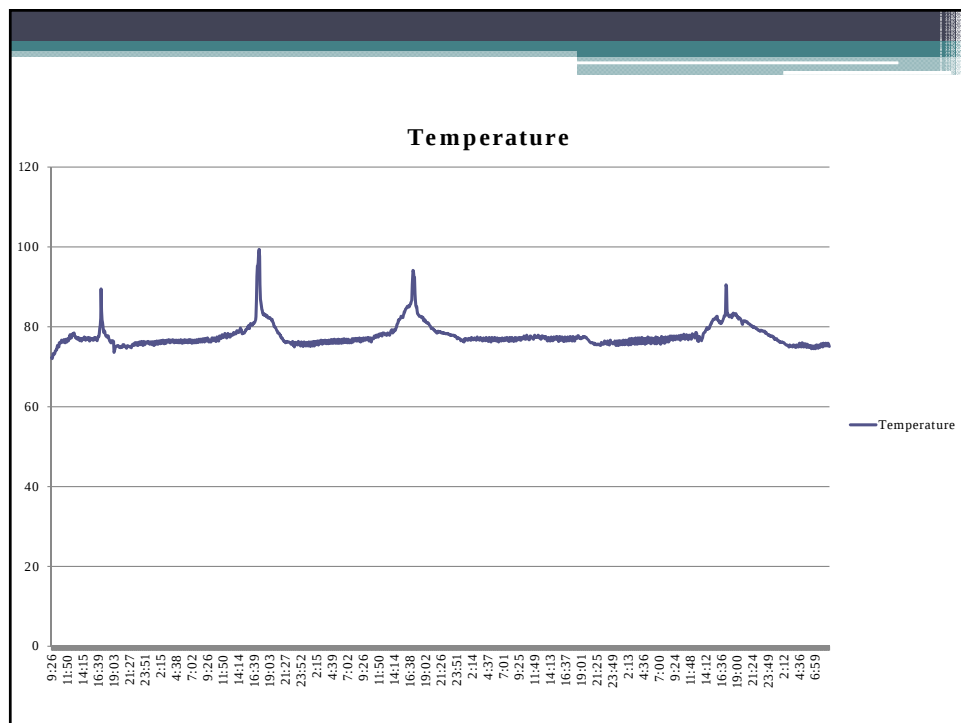
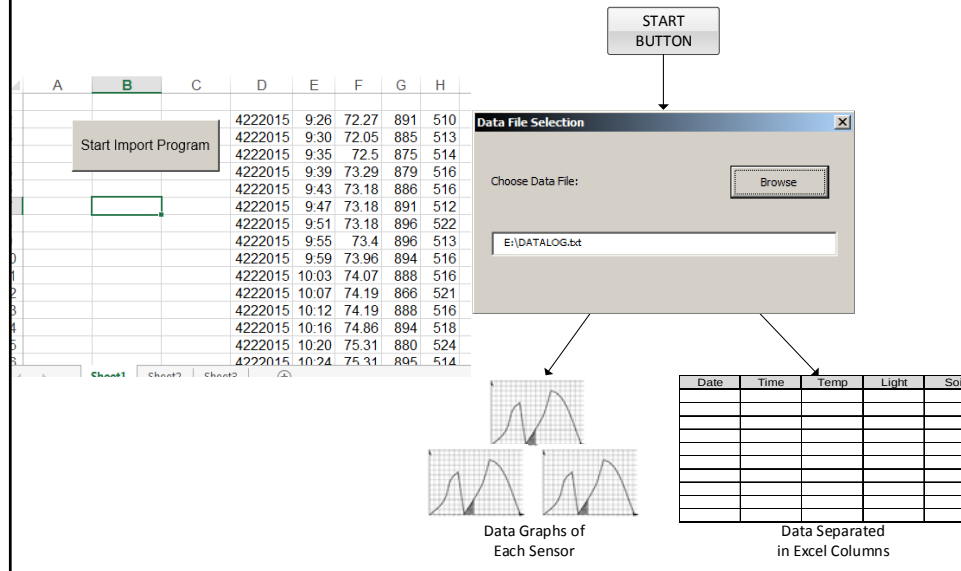
Software Design

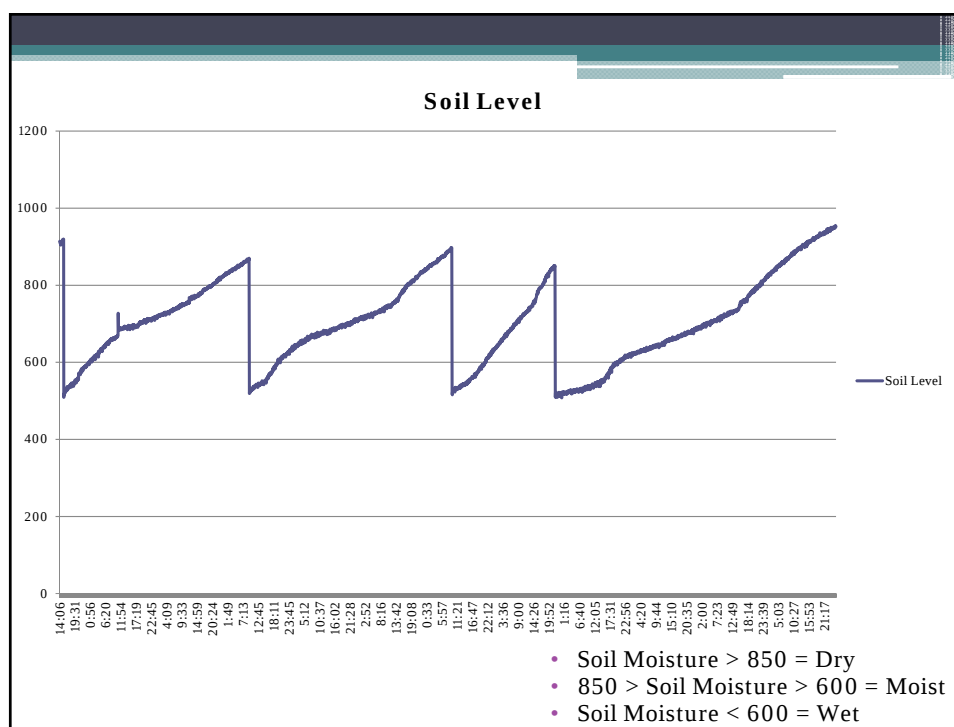
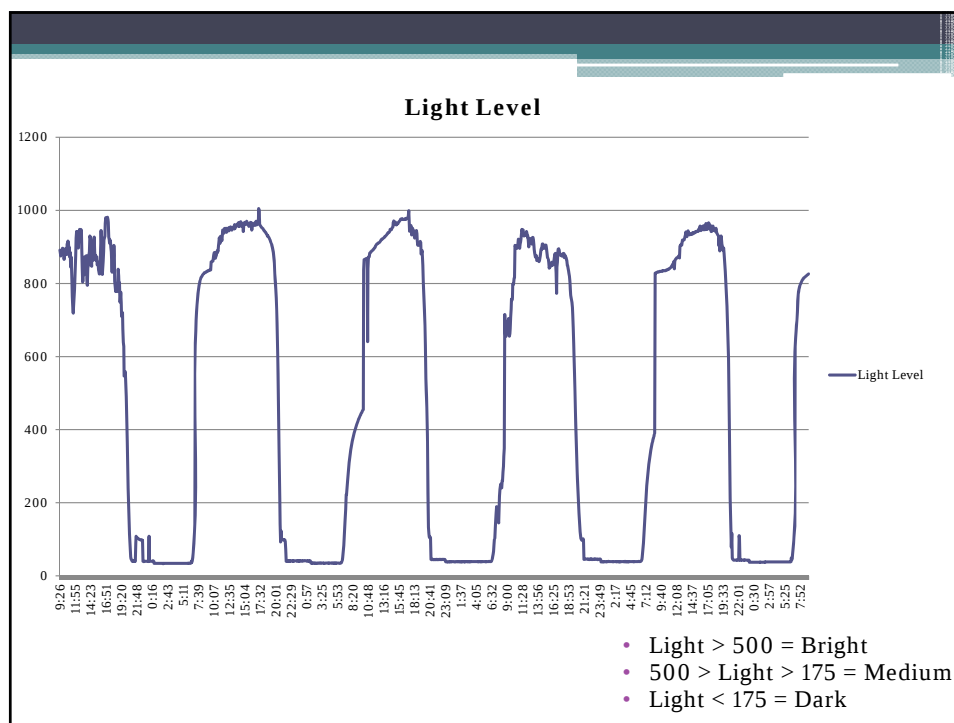


Data Testing

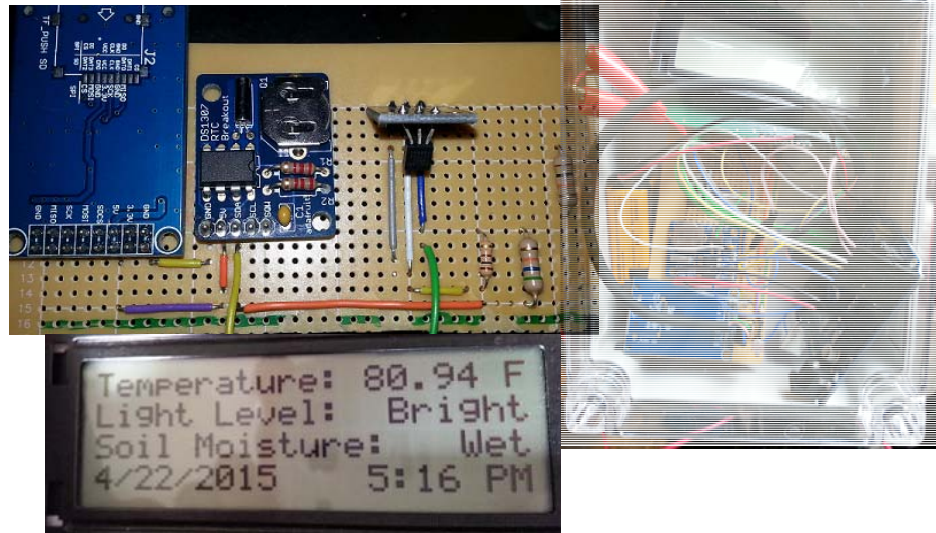


Data Importing





Product



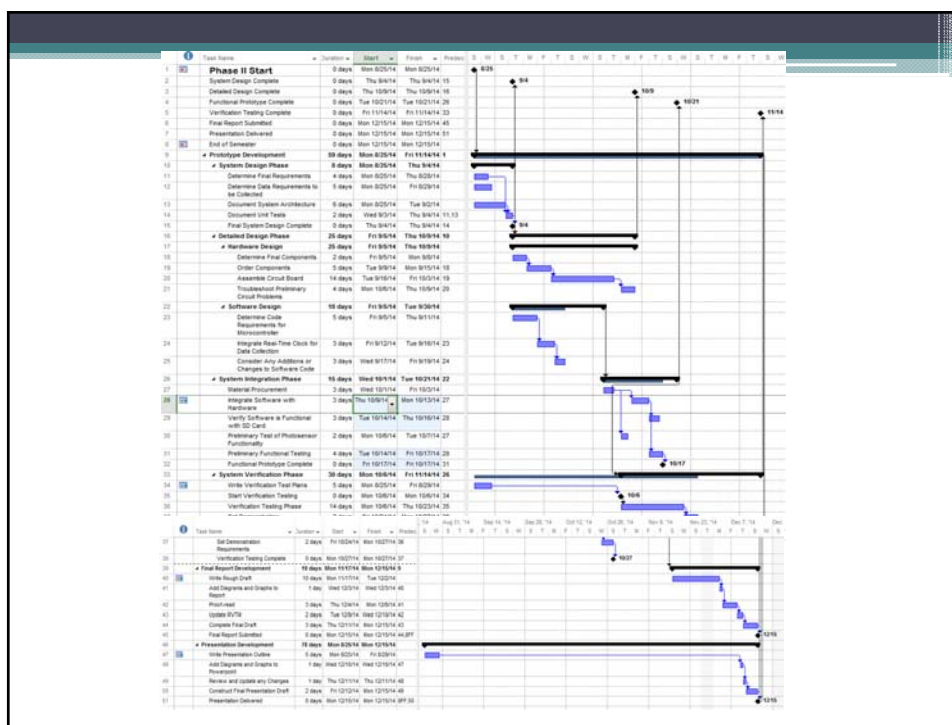
Cost

Material/Tool Cost			
Item	Qty	Cost Each	Total Cost
Arduino Uno Microcontroller	1	\$30.00	\$30.00
100 kOhm Resistor	2	\$0.10	\$0.20
10 kOhm Resistor	1	\$0.10	\$0.10
SD Card Socket	1	\$3.00	\$3.00
2GB SD Card	1	\$5.00	\$5.00
27-60 kOhm Photocell	1	\$0.89	\$0.89
9V Battery Clip	1	\$1.48	\$1.48
9V Battery	1	\$0.00	\$0.00
USB 2.0 A/B Cable	1	\$3.00	\$3.00
DS18B20 Temp Sensor	1	\$1.50	\$1.50
Screws for Soil Sensor	2	\$0.00	\$0.00
4x20 LCD Screen	1	\$17.70	\$17.70
Waterproof Project Box	1	\$19.95	\$19.95

Material Total	\$82.82
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Schedule

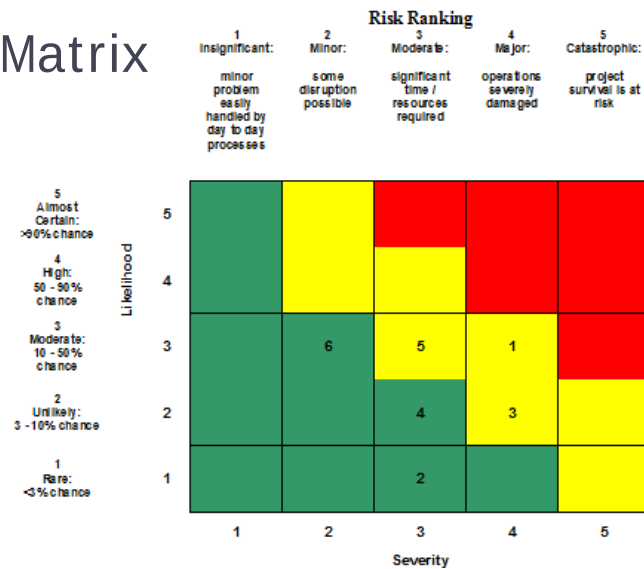
Task / Activity	Strawbridge
Determine Final Requirements	5
Document System Architecture	5
Document Unit Tests	5
Determine Final Parts List	5
Order Parts	1
Determine Software Microcontroller	3
Assemble Circuit Board	10
Troubleshoot/Error Checking	4
Build Weather-Proof Enclosure	5
Upload Software to Microcontroller	3
Preliminary Functional Testing	8
Write Verification Testing Plans	10
Initialize Circuit Board Data Parameters	2
Verification Testing	8
Download Data to Microsoft Excel	2
Create Visual Graphs of Data	4
Construct PowerPoint	5
Build and Insert Diagrams	1
Review Presentation Requirements	1
Final Draft of Presentation	1
Write Report Rough Draft	10
Review Rough Draft	1
Report Final Draft	1
Labor Hour Totals	100



Risk Management

ID	Entry Date	Type	Risk Description:		Consequence of Risk:	Status	Likelihood (1-5)	Severity (1-5)	Score	Rank*	Response	Description of Response
1	30-Mar-14	Cost	IF Power surge destroys microcontroller or other components	THEN	Budget may be exceeded because damaged components will need to be replaced	Open	3	4	12	Medium	Avoid	Make sure to test proper ratings for each component and include surge protection in design
2	30-Mar-14	Cost	IF Chosen microcontroller is not powerful enough to perform duties of the circuit	THEN	Microcontroller will require replacement	Open	1	3	3	Low	Mitigate	Purchase more powerful uC to handle all functions of the circuit
3	30-Mar-14	Schedule	IF Rain during outdoor test and shorts board connections	THEN	Delays completion of project and extra troubleshooting	Open	2	4	8	Medium	Avoid	Make sure to waterproof design with a clear bag or pay attention to weather forecasts
4	30-Mar-14	Schedule	IF Design does not function properly when completely assembled	THEN	More time is spent on troubleshooting problems of the project	Open	2	3	6	Low	Accept	Start project early to ensure enough time and troubleshoot any problems
5	30-Mar-14	Technical	IF Microcontroller does not write data to SD micro card	THEN	Data cannot be transferred to a computer to be visually analyzed	Open	3	3	9	Medium	Mitigate	Reload instructions to microcontroller and troubleshoot errors
6	30-Mar-14	Technical	IF Some components are obsolete or not available	THEN	Re-architecture of design is necessary	Open	2	3	6	Low	Mitigate	Identify similar components with the same functions as the originals.

Risk Matrix



Lessons Learned

- Microsoft Project
- Arduino Systems
- Organization
- Time Management
- Troubleshooting

Questions?

Demo