E - Plant Innovation

Group Members:

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David Hsu
Jae Sung Park
Yang Zhang

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Outline

- Background and Motivation
- Project and Technical Description
- Engineering Project Management
- Individual Involvement
- Q & A's

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Background and Motivation

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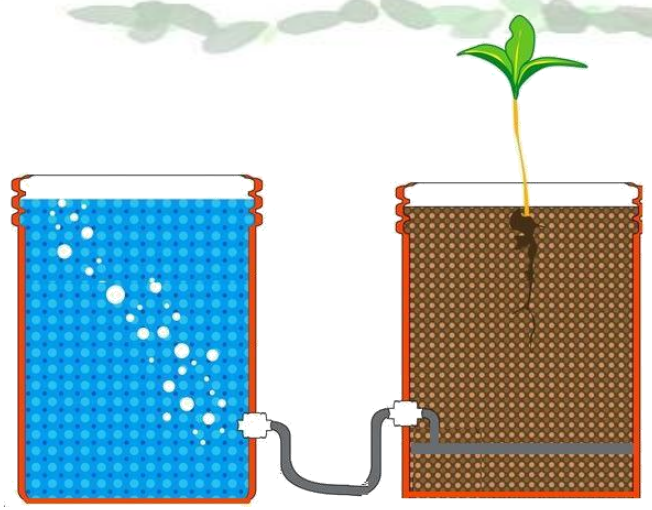
Background and Motivation

SmartPlant™:

Android Application



Automatic watering system

Protect from sun damage

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Project and Technical

M

Project and Technical Description

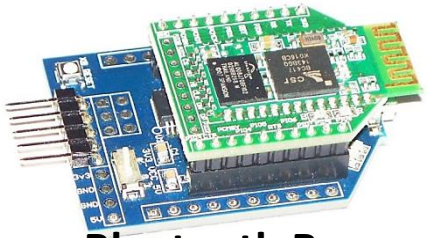
Mobile Device Android App Interface

MIT App Inventor

MIT App Inventor

ARDUINO

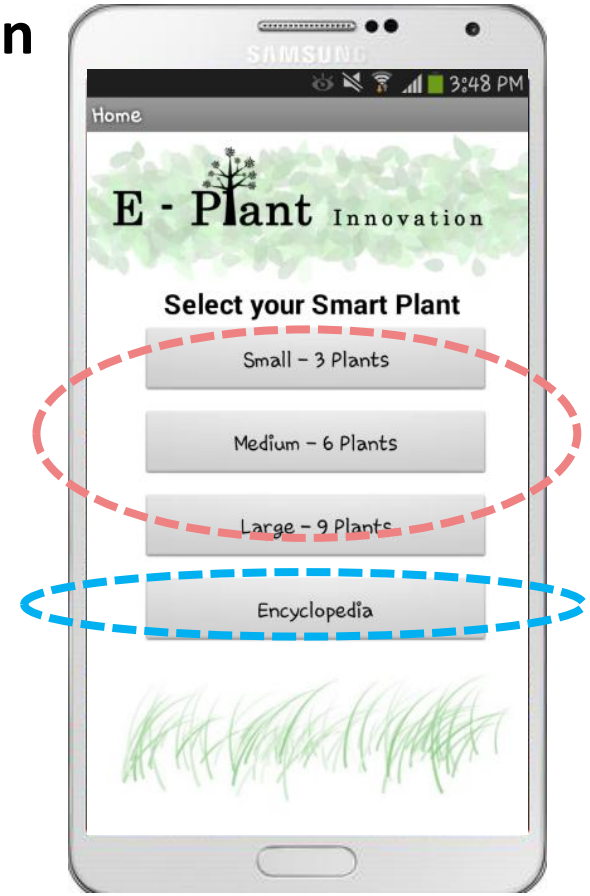
Arduino IDE



Bluetooth Bee

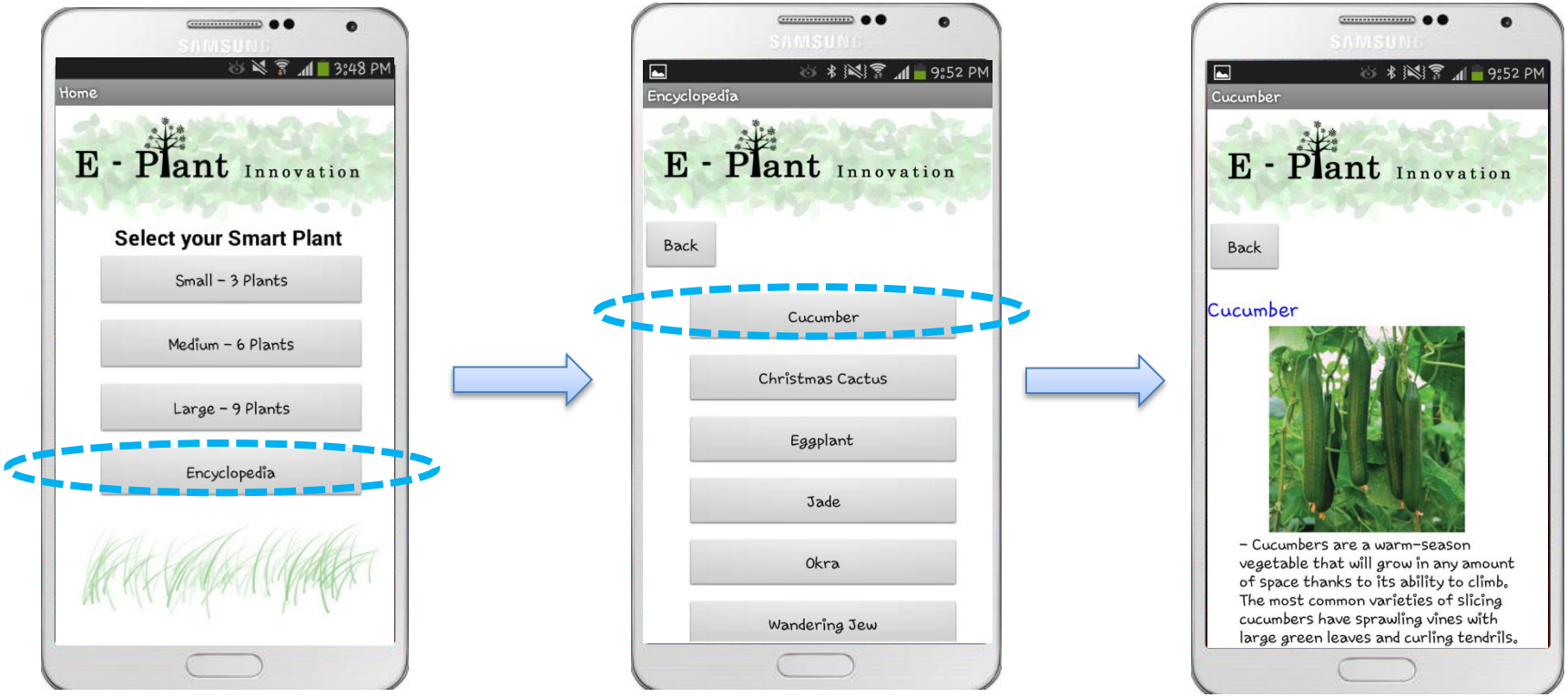
Arduino Uno

App screen transition

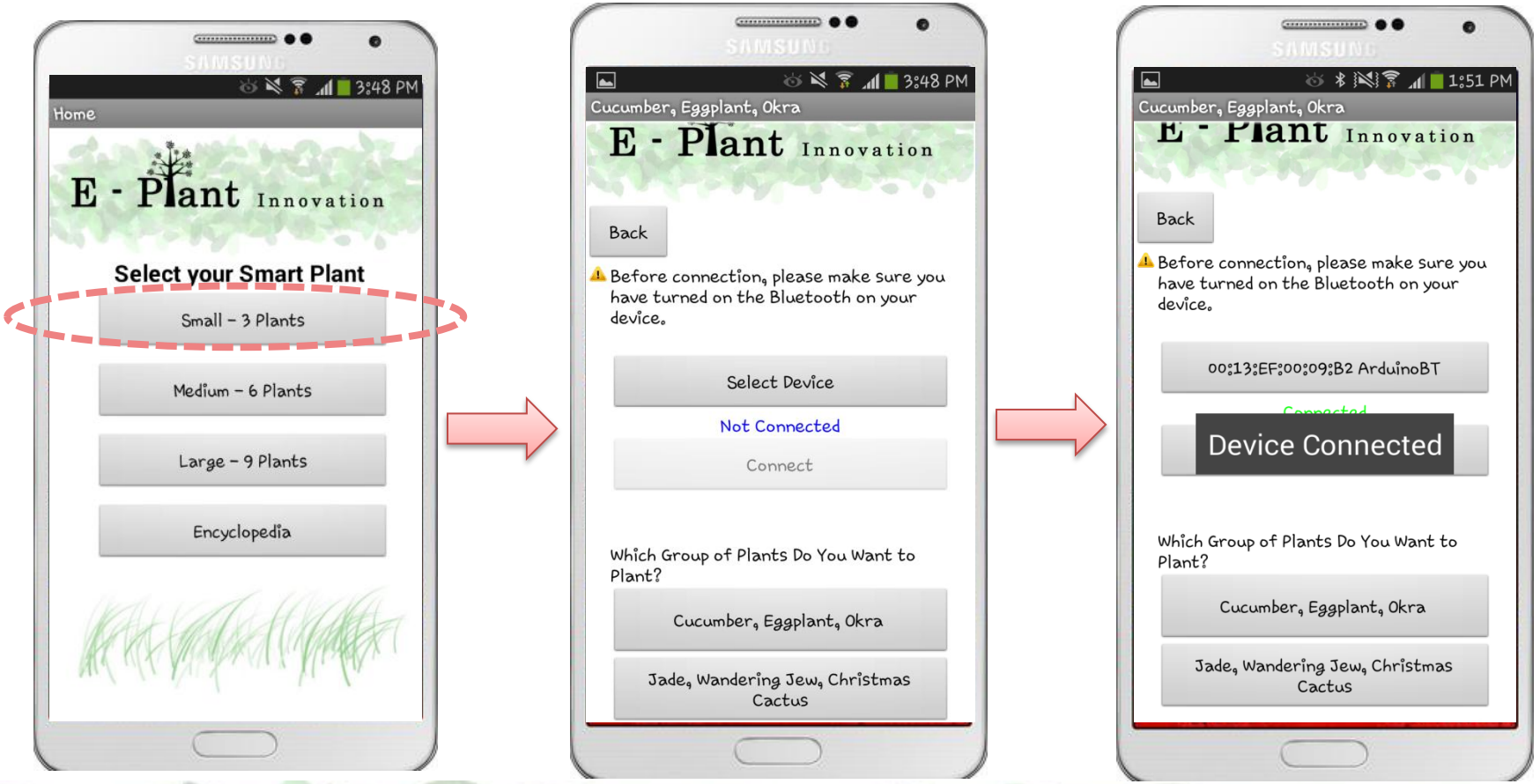


Home screen

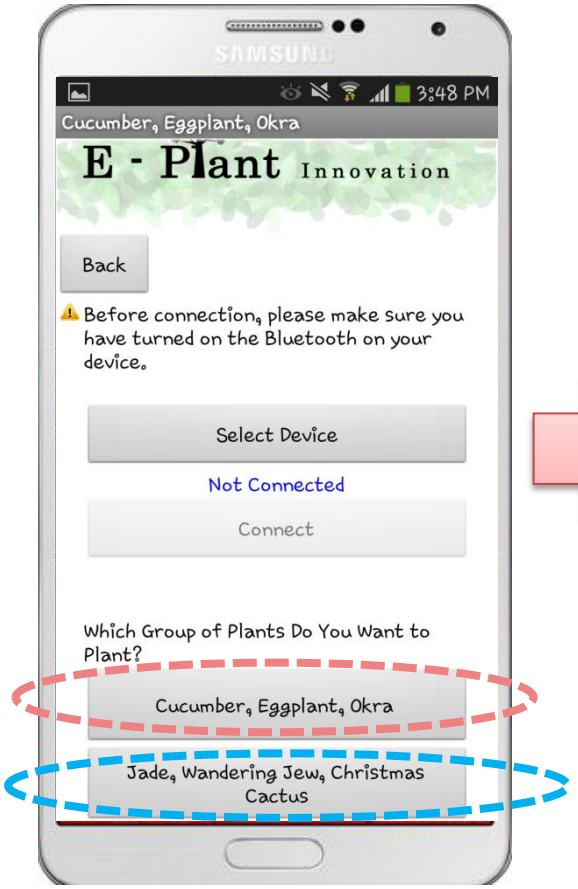
App screen transition (Encyclopedia)

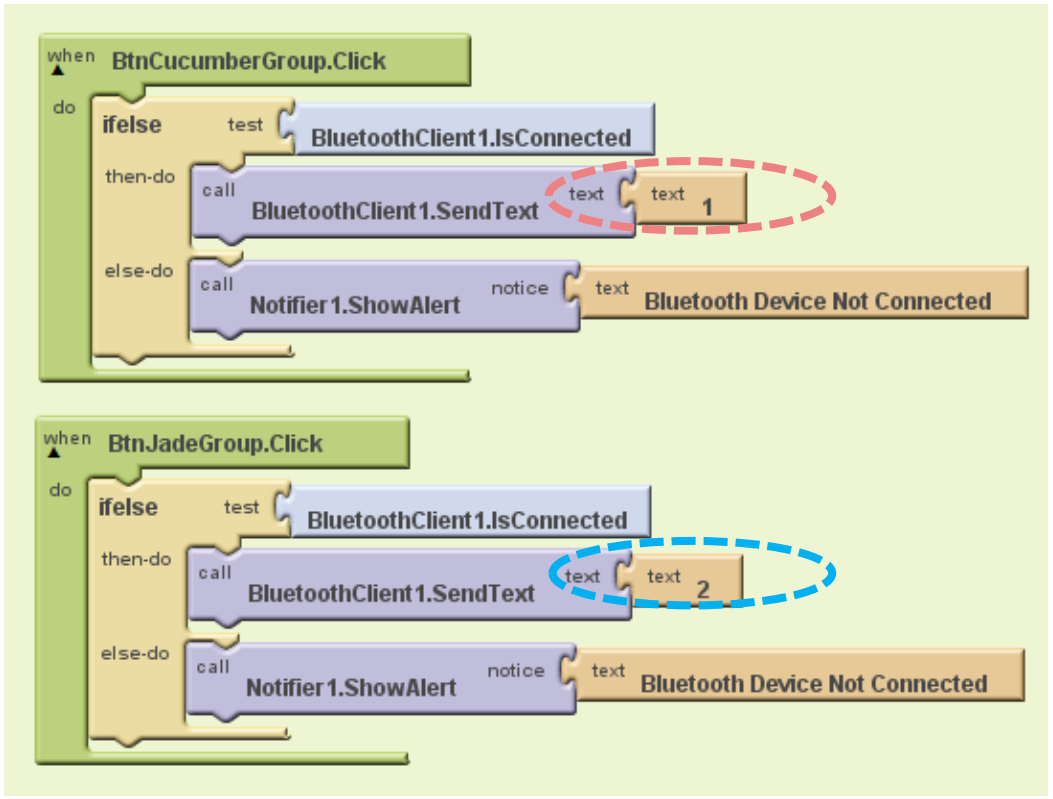


App screen transition (BT Connection and Plant group selection)



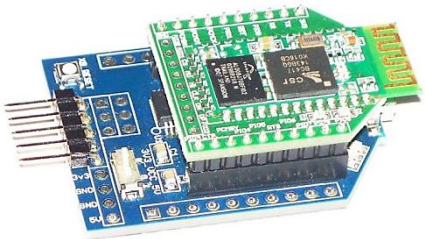
Summarized Bluetooth Signal Transfer (Android App)





MIT App Inventor

Summarized Bluetooth Signal Transfer (Arduino)



Bluetooth Bee

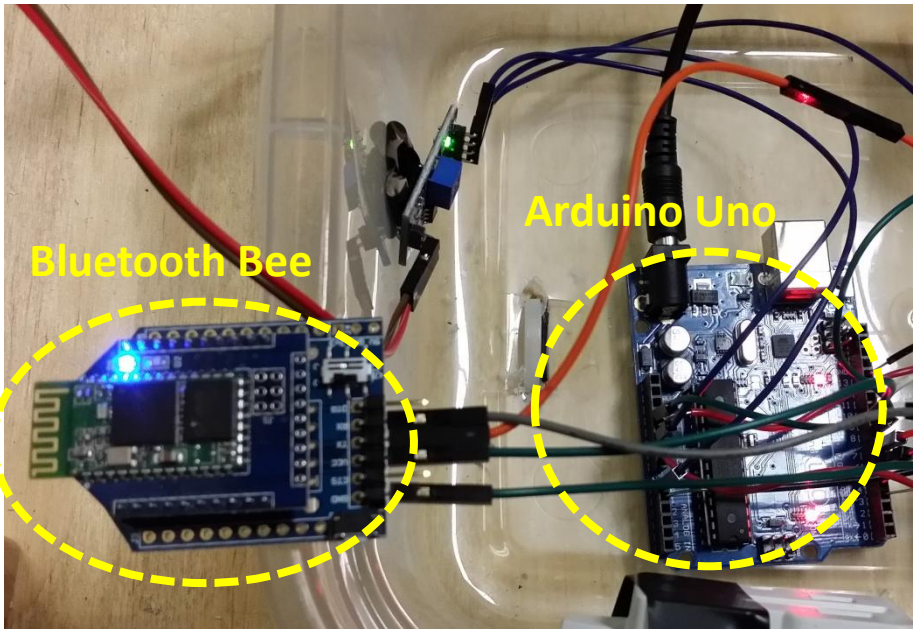
Arduino Uno

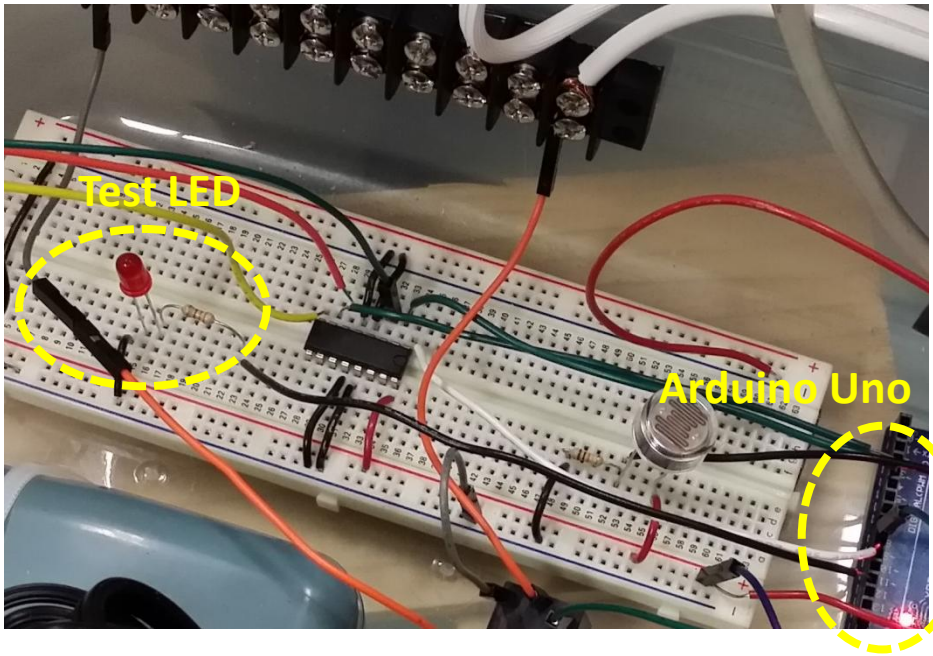
Arduino IDE

```
If (received_character == '1')
{
Turn LED ON;
Activate electric shade and water pump
according to Cucumber Group's requirement
}

If (received_character == '2')
{
Turn LED OFF;
Activate electric shade and water pump
according to Jade Group's requirement
}
```

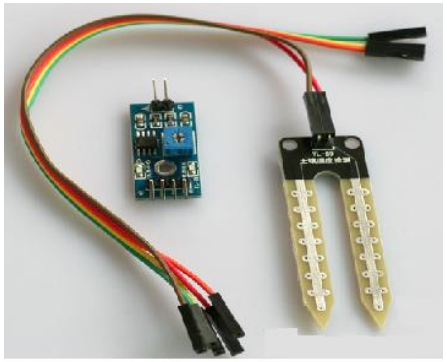
Setup of Working Arduino Uno & Bluetooth Bee





Watering System Interface

Arduino IDE



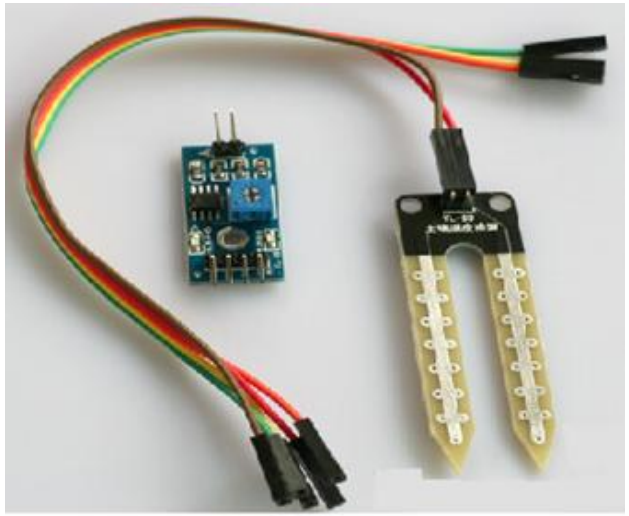
Moisture Sensor

Arduino Uno

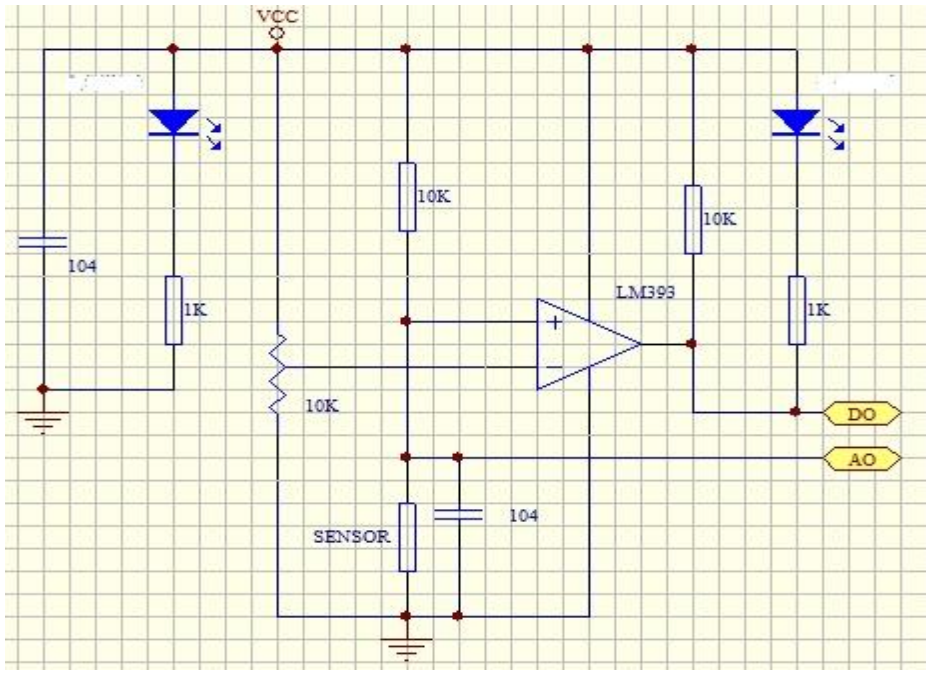
Relay

Water Pump

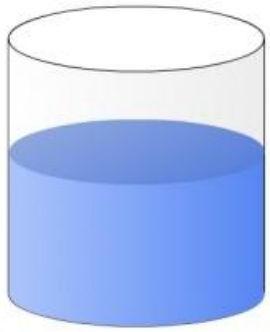
Schematic Diagram for the Moisture Detection Sensor Module



Moisture Sensor



Summarized Watering Signal Transfer (Arduino)

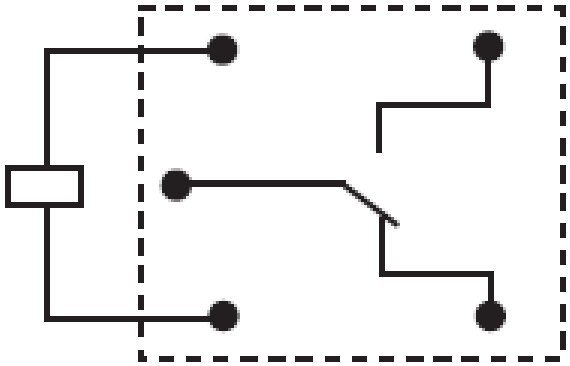


Arduino IDE

```
If (received_character == '1')
{
 if (moisture_value > 950)
Turn the water pump on
else
Turn the water pump off
}
If (received_character == '2')
{
if (moisture_value > 1000)
Turn the water pump on
else
Turn the water pump off
}
```

Terminal Configuration Diagram for Relay

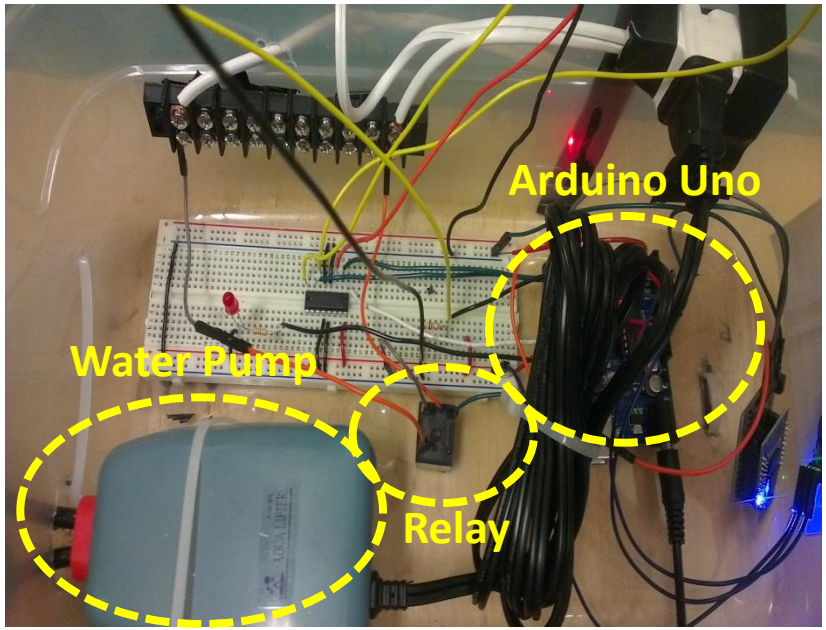
Relay

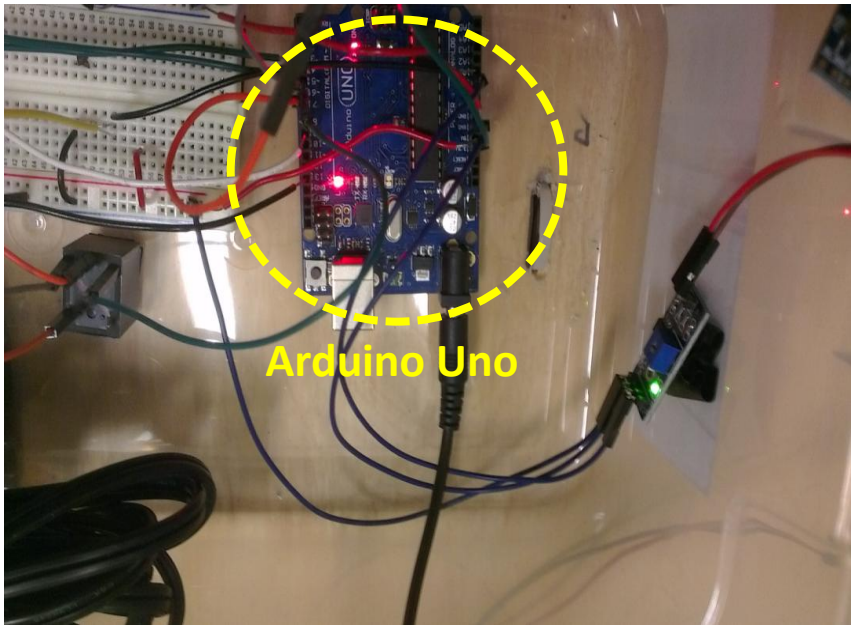


Terminal Configuration Diagram

Project and Technical Description

Setup of Working Arduino Uno, Moisture Sensor and Water Pump





Setup of Water Pump, Water Tank

Shading System:

Roller Shade

- Pulley and belt

- Tubular motor

Project and Technical Description

Shading Design:

Spring loaded shade

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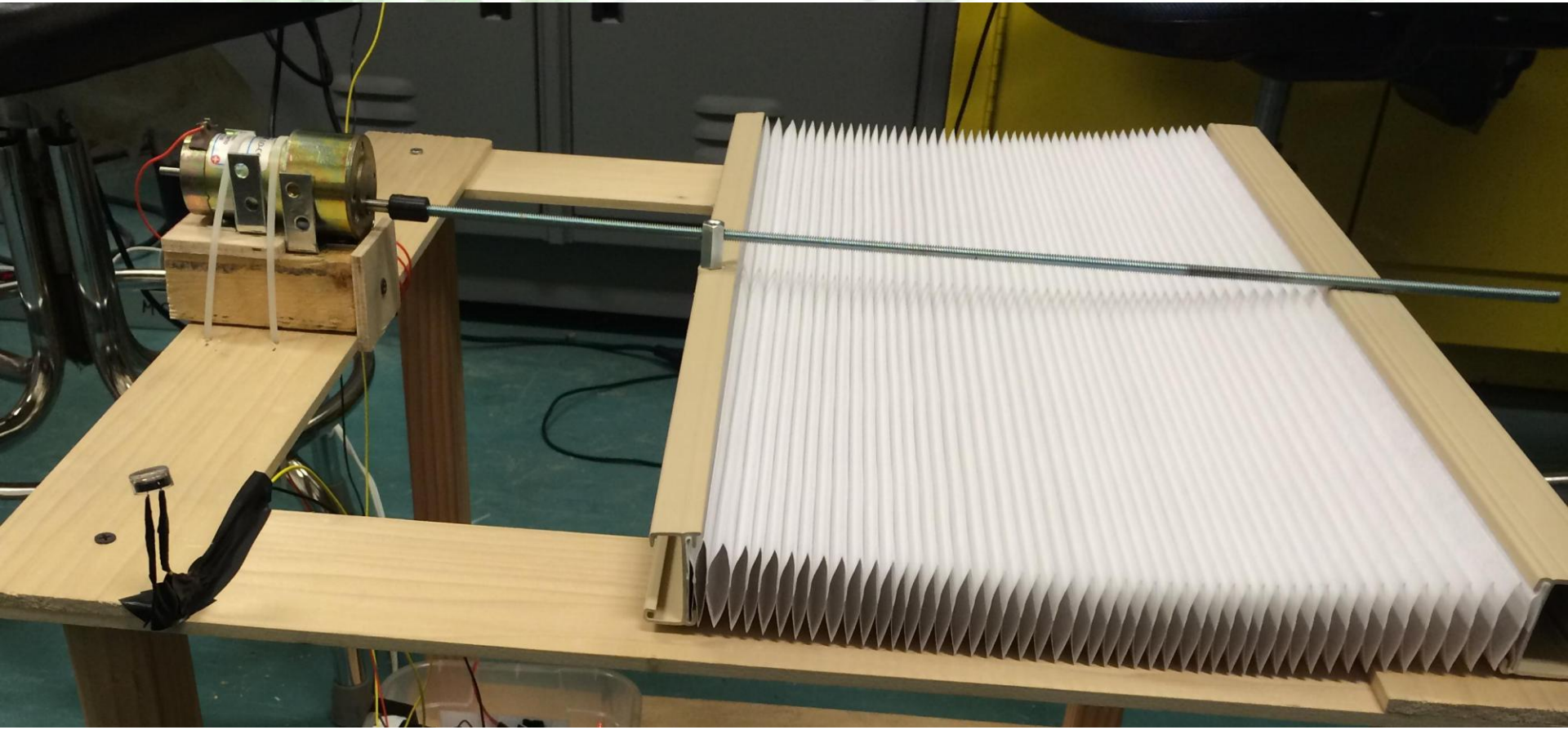
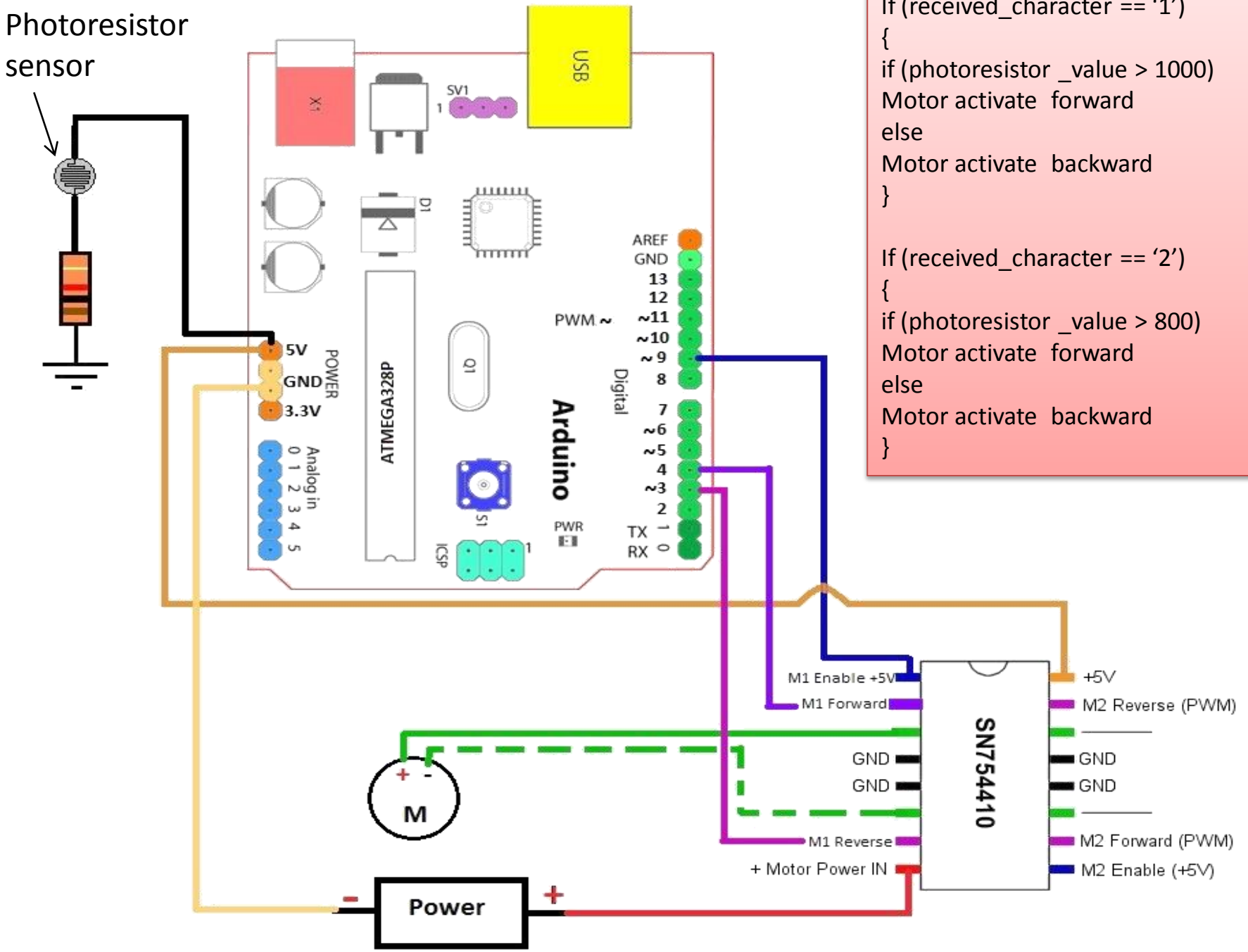
Project and Technical Description





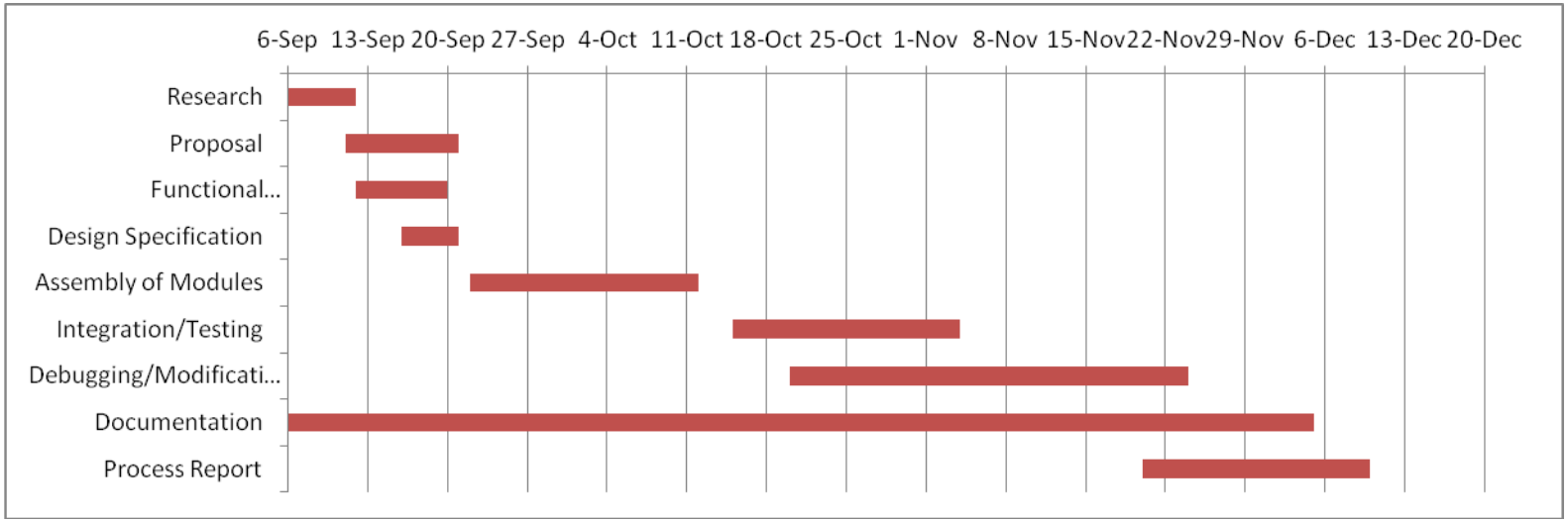

```
If (received_character == '1')
{
if (photoresistor _value > 1000)
Motor activate  forward
else
Motor activate  backward
}

If (received_character == '2')
{
if (photoresistor _value > 800)
Motor activate  forward
else
Motor activate  backward
}
```

Project and Technical Description

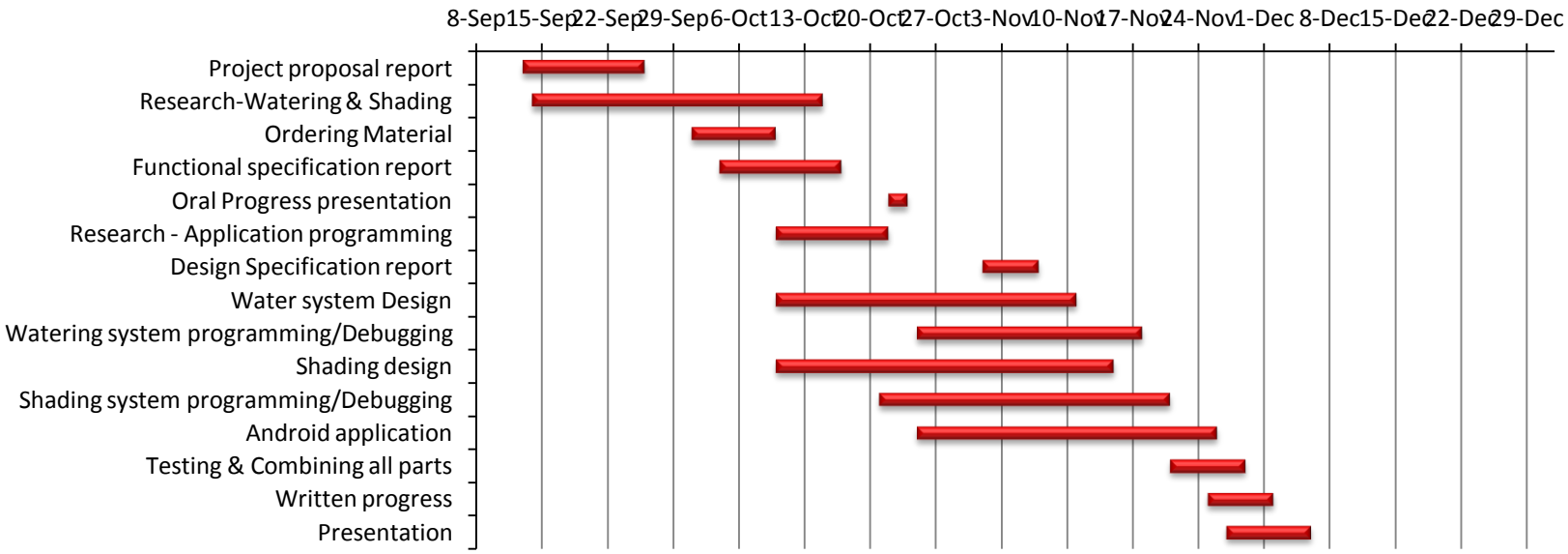
- **Functionality and Reliability:**
  - **Testing each part separately**

- **Limitations:**
  - **Analog pins on Arduino Uno limited to 10 bits**
  - **Extreme weather conditions**
    - **Watering system gets frozen**
    - **Exposed electric motor and wires**
  - **Shade opening speed**

Old Schedule:



New Schedule:



Marketing

Types of marketing:

- Student groups

- Presenting demos

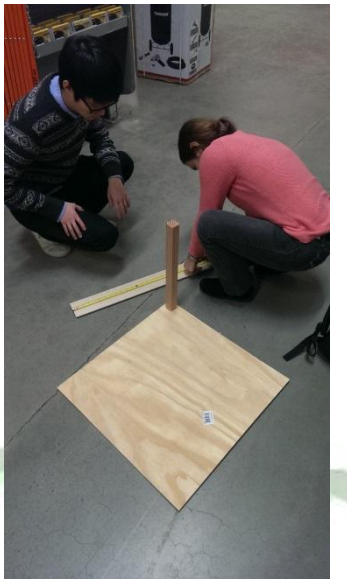
Budget:

Date	Item	Cost	Detail
09-Oct-13	water pump	$36.86	
10-Oct-13	Moisture sensor	$12.67	
10-Oct-13	Arduino Uno	$11.73	
12-Oct-13	BeagleBone Black	$5.96	original $60.87 - Returned $54.91
21-Oct-13	photo resistor sensor	$25.90	
06-Nov-13	Bluetooth BEE	$17.51	
22-Nov-13	motor connection	$33.94	
09-Nov-13	Tubular motor shade	$119.54	not received money yet
06-Nov-13	Water level sensors again	$5.26	not received
04-Nov-13	Jaesung (RP elec)	$120	
16-Oct-13	Yang (Relay and water tube)	$10	
09-Nov-13	Home depot	$139.24	31.32+ 19.42 + 19.83 + 47.85 +20.82
19-Nov-13	Mandan (RP elec)	$45.87	
Total		$584.48	

Individual Involvement

David

- Research
  - Shade system
    - Circuitry
    - Programming & Debugging
  - Optimal implementation
    - Collaborated with Mandan and Lucky
    - Went to Home Depot
  - Integration of parts together
    - Power Tools
- ENSC 220/320 helped with circuit design and logic
- CMPT 128 helped with Arduino IDE



Individual Involvement

Yang

- Moisture sensor module study
- Communication between Arduino and electrical parts
- Electrical component test and layout
- Setting threshold values of different options
- Programming watering system with Arduino IDE
- CMPT 128 helped programming Arduino IDE
- Coop experience helped a lot when constructing communication between microcontroller and water pump

Individual Involvement

Jae Sung

- **Focused & worked more on software (rather than hardware)**
  - **Android app developing**
    - Screen layout and transition
    - Functionality of button on the screen
    - MIT App Inventor
  - **Bluetooth communication programming**
    - Arduino Bluetooth module research
    - Arduino IDE

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Individual Involvement

- Team dynamic proved useful
- Work load during the semester well distributed (Hardware/Software)
- Programming Android app with MIT App Inventor saved time
- Helped Yang and Mandan programming watering/shading system with Arduino IDE
- CMPT 128 (C++) was useful when programming Arduino IDE
- ENSC 350 (microcontroller) helped a lot when constructing connections between microcontroller and other parts

Individual Involvement

Mandan

- Research
- Scheduling
- Finance
- Shading Design

- ENSC 220 ⟶ Circuit
- ENSC 230 ⟶ Hockey player

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Acknowledgements

- Thanks to Lucky and all the TAs for constant feedback
- Special thanks to Gary Houghton