Low Level Software – Design Documentation

Purpose:
The purpose of this document is to describe the design specification for the Low-Level Software Milestone for the capstone project, "Automated Plant Watering."

Audience:
This document is written for the Software & Hardware Engineering team at JTA Embedded Solutions.

Overview:
This demonstration of low-level software will show the main purpose of this project, which is to be able to automatically water a plant based on the soil moisture level. The product will simply detect dry soil versus wet soil using the soil moisture sensor, and turn on the water supply when dry soil is detected, and turn off the water supply when wet soil is detected.

Demonstration:
There will be 4 Red Dixie cups set up for the demonstration.
Cup 1[Dry Soil] – ¾ Cup of Soil
Cup 2[Wet Soil] – ¾ Cup of Soil + ¼ cup of water
Cup 3[Water] – Cup filled with water + water pump with hose connected inside the cup
Cup 4[Empty] – Empty cup with end of water hose inserted

The soil moisture sensor and water pump will be connected to an Arduino Uno using the circuit diagram sown in Appendix A.

Steps:

1. Insert soil moisture sensor into wet soil. Display should show a high humidity level. The water pump should not turn on because the soil is already wet.
2. Insert soil moisture sensor into dry soil. Display should show a low humidity level. The water pump should turn on and transfer water from Cup 3 into Cup 4.

Optional Demonstration:
Since the end product will consist of a Bluetooth communication to a mobile app, we can optionally display Soil Moisture levels through the app. A manual over ride button to turn on and off the water pump via Bluetooth can also be included.

Design Specification:

The input of the soil moisture sensor will be connected to Analog Pin 0 (A0) on the Arduino Uno. The output switch for the water pump will be connected to Digital Pin 11 (D11).

To calculate Soil Moisture level:

```
soilMoistureRawVal = 1023 - analogRead(Pin_A0)
```

To convert moisture raw level into a percentage:

```
if (soilMoistureRawVal < 800){
      soilMoisturePercentage = (soilMoistureRawVal/800)*100;
}
```

*Max raw value for 100% moisture is 800.

Conditions to control water pump:

```
if (soilMoisturePercentage <= 25){
      //Turn on Water Pump
}
else {
      //Turn off Water Pump
}
```

Optional Design specification:

1. Display Data through Bluetooth on a mobile device
2. Manual over ride to turn on and off water pump through Bluetooth

Appendix A: Circuit Diagram for Low Level Software Implementation