Spring 2023 ECE 445 Team Contract Fulfillment

Project Goals

The goals for this project that we had set out to achieve in this semester are as follows:

1. The moisture sensors should be able to detect the current level of moisture in the soil to an accuracy of +-5%, logged on an SD card and displayed on an LED bar graph

2. The system should be able to provide irrigation when moisture level falls beyond a set threshold level as inputted using a keypad and maintain it to an accuracy of +-5%

3. The system should be scalable to four different pots and the moisture level maintained at 100%, 75%, 50% and 25% in each of the respective pots

As our team faced issues with the PCB order and late delivery, it was decided that the entire project would be built on a breadboard system and utilize Arduinos instead. As of the Wednesday before the final demo date, each of the different subsystems of the project - in particular the keypad in reading data, the SD card in logging the moisture level sensor values and LED bar graph in displaying these values - are working individually and Goals 1 and 2 have been met. Our team is still working on Goal 3 in putting all the subsystems together for the soil moisture controller to work with four different pots across various moisture levels before the final demo.

Expectations

The expectations that were set out in the Team Contract were met. All team members have consistently provided weekly updates on the progress made, with the two meetings that our team has in a week - the weekly meeting with our TA and the ABE Capstone Project Team - serving as a good checkpoint on the work performed in the week. All team members have also turned up at the weekly TA meetings to listen to valuable feedback on the project and how to deal with the different problems or challenges that have surfaced throughout the course of the semester. Regular observations and notes on the project were taken in the individual lab notebook.

Roles

The roles in our project were largely divided across the different subsystems, with Ren Yi working on power supply and user interface subsystem, Isabel working on data logging and irrigation subsystem, and First working

on controller subsystem and PCB design. The combination of different subsystems were done together as a team. There was not a team leader assigned but rather each member contributing his/her respective part and communicating updates consistently. These roles stayed largely the same throughout the semester. Pieces of the project were tackled together as a team, where team members would assist each other and lend his/her respective expertise when the need for software/hardware debugging arises.

Agenda

Our team made decisions on the project through active discussions across all team members and eventually reaching a consensus. There would also be regular consultations with the ABE team as well as USDA if there was any need for clarifications. If there were any issues or concerns that arose, a group member would communicate them in the groupchat or in-person so that other members could help.

Team Issues

The biggest challenge our team faced during the course of the project was the delay in the arrival of our PCB due to the requirements by USDA in ordering the PCB with the vendor, where we only received the first PCB order three weeks prior to the demo. Our team dealt with it by consulting our TA and the head TA about the situation and making the decision to build the system on the breadboard so that we would have a working prototype to demonstrate. The process set out in the team contract was followed by ensuring effective communication with each other. Another challenge was in adjusting the specifications of the project according to the requirements set by USDA, which would force us to modify the design of our project in the middle of the planning and assembling phase. These changes can affect the final design to serve a slightly different high-level requirement initially put in the design document at the beginning of the semester. For example, an additional requirement is that the pots should not be watered more than four times a day which restricts us to check moisture level and water the plants once every six hours. With this limitation, we are unable to fully utilize the control system we originally designed that constantly waters the plants whenever the moisture level drops lower than the desired range.