R.A.D Technologies Greenhouse

Monitoring System

Status

/1 Hardware present?

/1 Title Page

/1 Declaration of Joint Authorship

/1 Proposal (500 words)

/1 Executive Summary

Ryan McAdie

Declaration of Joint Authorship

We, Ryan McAdie, Daniel Bujold, and Aiden Bolos, confirm that this work submitted is the joint work of our group and is expressed our own words. Any uses made within it of the works of any other author, in any form (ideas, equations, figures, texts, tables, programs), are properly acknowledged at the point of use. A list of the references used is included. The work breakdown is as follows: Each of us provided functioning, documented hardware for a sensor or effector. Ryan McAdie provided documentation for the BME680 Gas and Air Quality Sensor. Daniel Bujold provided documentation for the Capacitive Moisture Sensor. Aiden Bolos provided documentation for the DS18B20 Temperature Sensor. In the integration effort Ryan McAdie is the lead for further development of our mobile application, Daniel Bujold is the lead for the Hardware, and Aiden Bolos is the lead for connecting the two via the Database.

Proposal

We have created a mobile application, worked with databases, completed a software engineering course, and prototyped a small embedded system with a custom PCB as well as an enclosure (3D printed/laser cut). Our Internet of Things (IoT) capstone project uses a distributed computing model of a smart phone application, a database accessible via the internet, an enterprise wireless (capable of storing certificates) connected embedded system prototype with a custom PCB as well as an enclosure (3D printed/laser cut), and are documented via this technical report targeting OACETT certification guidelines.

Intended project key component descriptions and part numbers

Development platform: Raspberry Pi (Broadcom Development Platform)

Sensor/Effector 1: BME680

Sensor/Effector 2: Capacitive Moisture Sensor EK1940

Sensor/Effector 3: DS18B20 Temperature Sensor

We will continue to develop skills to configure operating systems, networks, and embedded systems using these key components to complete a small-scale system of a greenhouse monitoring system that will be capable of accurately retrieving and displaying real time up to date vital information for the greenhouse environment. Systems like this currently exist in the world today, however looking at Humber's current system we noticed that all changes can only be made from a central computer located in the greenhouse, we would like to incorporate a remote monitoring and allow remote changes to our system for convivence and to always know how the greenhouse is

doing. We also plan to incorporate systems that can be accessed remotely from inside the greenhouse using our related mobile application. Such systems we currently have in mind are; an irrigation system that can automatically or manually water the plants as needed, a ventilation system that can be accessed to regulate temperatures inside the greenhouse and a blind system that can be used to block intense light and heat from the sun if needed for the plants.

Our project description/specifications will be reviewed by, Valeria an employee of the Humber Greenhouse, ideally an employer in a position to potentially hire once we graduate. They will also ideally attend the ICT Capstone Expo to see the outcome and be eligible to apply for NSERC funded extension projects. This typically means that they are from a Canadian company that has been revenue generating for a minimum of two years and have a minimum of two full time employees.

The small physical prototypes that we build are to be small and safe enough to be brought to class every week as well as be worked on at home. In alignment with the space below the tray in the Humber North Campus Electronics Parts kit the overall project maximum dimensions are 12 13/16" x 6" x 2 7/8" = 32.5cm x 15.25cm x 7.25cm.

Keeping safety and Z462 in mind, the highest AC voltage that will be used is 16Vrms from a wall adapter from which +/- 15V or as high as 45 VDC can be obtained. Maximum power consumption will not exceed 20 Watts. We are working with prototypes and that prototypes are not to be left powered unattended despite the connectivity that we develop.

Executive Summary

With our greenhouse system users will be able to monitor real time vital information to their greenhouses such as temperature, humidity and soil moisture. These values will be updated in real time so users will always know the state of the greenhouse and if changes need to be made. We are also going to implement a remote management system for certain features of the greenhouse such as an irrigation/feeding system, ventilation and fan system and a light blocking or blind system. With all these, a user would be able to take manual control of the greenhouse and make remote changes to the system that could potentially be better for the plants then just using the automated system. Our system will be one of the first of its kind to implement all the necessary features of a greenhouse monitoring system as well as go above and beyond to achieve features and requirements that would make managing a greenhouse a little more easier with more peace of mind knowing that your plants are always in your hands.