Projects website: http://StudentEng2016.github.io/

FarmBot

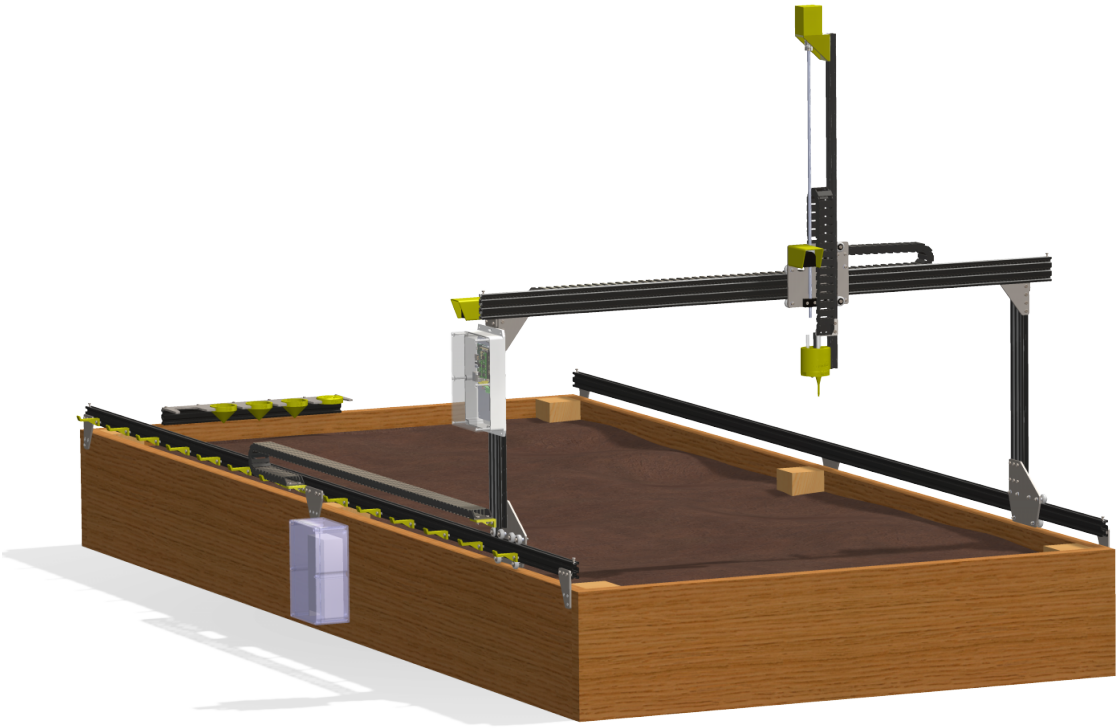

Figure 1:

Image source: (Day, 2016)

From: Alisha Singh Chauhan, Adanegbe Amadasun

Discipline: Computer Engineering Technology

Date Submitted: March 03,2017

Declaration of Joint Authorship

We, Alisha Singh Chauhan and Adanegbe Amadasun students of Applied Technology department hereby declare that the following technical report submitted for CENG 355 Computer Systems Project is expressed in our own words.
The work which has been used from various sources like: words, numerical data, figures, tables etc. has been either paraphrased or cited separately. The original sources of cited work may be located using IEEE style in References page at the back.

Executive Summary

As a student in the Computer Engineering Technology program, we will be integrating the knowledge and skills we have learned from our program into this Internet of Things themed capstone project. This proposal requests the approval to build the hardware portion that will connect to a database as well as

to a mobile device application. The internet connected hardware will include a custom PCB with sensors and actuators for an automated farming device. The mobile device functionality will include will include photo sensors, temperature sensors and moisture sensors which will be and will be further detailed in the mobile application proposal. We will be collaborating with the following company/department. In the winter semester I plan to form a group with the Alisha Singh Chauhan who is also building similar hardware this term and working on the mobile application with me. The hardware will be completed in CENG 317 Hardware Production Techniques independently and the application will be completed in CENG 319 Software Project. These will be integrated in CENG 355 Computer Systems Project.

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List of Illustrations

1. Introduction

An open source automated farming device which operates like a 3D printer. But instead of extruding plastic, its tools are seed injectors, watering nozzles, sensors etc.

FarmBot is going to address some the problems the agricultural industry faces like lost of money, how ineffective some of their equipment are and how they waste resources. FarmBot is going to be more economical and ecofriendly unlike other agricultural equipment being used. It incorporates precision farming, which happens to be a concept based on observing, measuring and responding to inter and intra-field variability in crops. The device is going to be constructed be the FarmBot company, it is going to be made of an Arduino Mega 2650, Raspberry Pi 3, disassembled hardware packages and other software sources. The FarmBot Genesis runs on custom built tracks and other supporting infrastructure which needs to be self assembled. The robot itself relies on a GUI platform which users can access through the FarmBot's web app. The physical robotic system is set in alignment with the crops that are plotted out in the virtual version on the web app. This is how FarmBot can be efficient and reliably distribute water, fertilizer and other elements to keep the plants healthy and striving without minimal wastage. The device is going to be cheaper than convention tools and more efficient.

We have searched for prior art via Humber's IEEE subscription selecting "My Subscribed Content" (Billingsley, Oetomo, & Reid, 2009) and have found and read (Bergerman et al., 2015) which provides insight into similar efforts.

In the Computer Engineering Technology program, we have learned about the following topics from the respective relevant courses:

- Java Docs from CENG 212 Programming Techniques In Java,
- Construction of circuits from CENG 215 Digital And Interfacing Systems,
- Rapid application development and Gantt charts from CENG 216 Intro to Software Engineering,
- Micro computing from CENG 252 Embedded Systems,
- SQL from CENG 254 Database With Java,
- Web access of databases from CENG 256 Internet Scripting; and,
- Wireless protocols such as 802.11 from TECH152 Telecom Networks.

This knowledge and skill set will enable me to build the subsystems and integrate them together as my capstone project.

2. Body

2.1 Purpose

FarmBot is going to address some the problems the agricultural industry faces like lost of money, how ineffective some of their equipment are and how they waste resources.

2.2 Hardware Specification

Figure 2:

Image source: (Krassenstein, 2014)

Image source: (Inc, 2017)

(Describe farmbot parts)

FarmBot will be able to perform the following task:

- Monitor the temperature around the plant,
- Provide light to the plant.

The hardware component for FarmBot that We have are:

- Raspberry pi 3 – It is used to receive data from FarmBot and send it to the Arduino

Image source: (Pimoroni, 2017)

- Arduino mega 2560 – It is used to control the bi-polar stepper motor


FarmBot
Seeder
Water
The Universal Tool Mount
Featuring 12 electrical connections, three liquid/gas lines, and magnetic coupling.
Seed Injection
Powered by a vacuum pump, the seeder sows with millimeter accuracy.
Watering
Precision water your plants with the gentle shower of this nozzle.
Soil Sensor
Weeder
The Soil Sensor
Measure moisture content to optimize for all soil types and environments.
Camera
FarmBot always keeps its eye on your garden to detect weeds and monitor plant health.
Weed Suppression
This tool physically disrupts and destroys the fragile root systems of infant weeds.

Figure 3:

Figure 4:

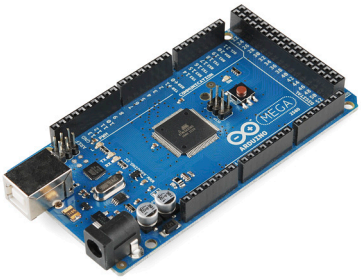

Figure 5:

Image source: (Robotics & Electronics, 2017)

- Sensor Hat (light and temperature) – It is used to receive data about light and temperature from surrounding.
- Bi-polar Stepper motor – It controls the movement of the FarmBot

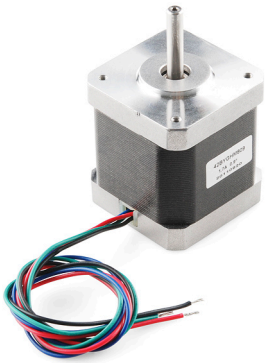

Figure 6:

Image source: (Controls, 2017)

2.3 Software Specification

2.3.1 Database Work Breakdown

Currently, We only have a local database for our FarmBot project. The database stores the plant number, date, and name locally. Once the app is deleted the users will lose access to all their data.

We plan on getting a server to so all users data can be stored in the cloud and can be accessed by them at any time

2.3.2 Application and work breakdown

FarmBot is going to be more economical and ecofriendly unlike other agricultural equipment being used. It incorporates precision farming, which happens to be a concept based on observing, measuring and responding to inter and intra-field variability in crops. The device is going to be constructed be the FarmBot company, it is going to be made of an Arduino Mega 2650, Raspberry Pi 3, Sensor hat (which can read temperature, light, and soil condition), and Bi-polar stepper motor.

We plan on using the an arduino mege2560 to control the bi-polar stepper motor to make it move on its X-axis

2.3.3 Web and work breakdown

An app was created to use for the FarmBot, this app would be used to control the FarmBot to plant seed at desire position in the bed. Also, the user can choose the option of giving the FarmBot light for a duration of time, watering the plant etc.

After installing the app on your mobile phone, users will be prompt to create an account by choosing user name and password. This will then give them access to their FarmBot and its data stored in the cloud.

The user can then pick the seed of the crop they want to plant, and the care option they want to apply to the seed (i.e. The light duration, or how frequently they want to water the plant) and submit the options they picked

The user would be given the access to control the FarmBot and apply the option picked from the previous screen.

We plan on connecting FarmBot's app with raspberry pi, so that users can be able to send data to it.

Concluding remarks

This proposal presents a plan for providing an IoT solution for FarmBot This is an opportunity to integrate the knowledge and skills developed in our program to create a collaborative IoT capstone project demonstrating my ability to learn how to support projects. We request the approval of this project.

References

These are the references We am going to use for the duration of this project, though if we come across other references we will add them.

(Billingsley et al., 2009)

(Bergerman et al., 2015)

(Corporation, 2017)

(Inc, 2017)

(Day, 2016)

(Krassenstein, 2014)

Bergerman, M., Maeta, S. M., Zhang, J., Freitas, G. M., Hamner, B., Singh, S., & Kantor, G. (2015). Robot farmers: Autonomous orchard vehicles help tree fruit production. *IEEE Robotics Automation Magazine*, *22*(1), 54–63. https://doi.org/10.1109/MRA.2014.2369292

Billingsley, J., Oetomo, D., & Reid, J. (2009). Agricultural robotics [tC spotlight]. *IEEE Robotics Automation Magazine*, *16*(4), 16–16, 19. https://doi.org/10.1109/MRA.2009.934829

Controls, O. (2017). Bipolar stepper motor 42BYGHM809. Retrieved from https://oceancontrols.com.au/SFM-002.html

Corporation, C. (2017). Raspberry pi 3 complete starter kit - 32 gB edition. Retrieved from https://www.canakit.com/raspberry-pi-3-starter-kit.html

Day, S. (2016). Farmbot: The robot to grow your garden with ease. Retrieved from http://www.directcannabisnetwork.com/farmbot-the-robot-to-grow-your-garden-with-ease/

Inc, F. (2017). Interchangeable tooling. Retrieved from https://farmbot.io/

Krassenstein, E. (2014). FarmBot: An open source 3D farming printer that aims to create food for everyone. Retrieved from https://3dprint.com/12325/farmbot-3d-farming-printer/

Pimoroni. (2017). Raspberry pi 3. Retrieved from https://shop.pimoroni.com/products/raspberry-pi-3

Robotics, P., & Electronics. (2017). Arduino mega 2560 r3. Retrieved from https://www.pololu.com/product/1699