

Minor Project Report

INTRODUCTION:

For this minor project, I chose to grow a bean plant name Beantrice! It consisted of various types of beans, ranging from green beans, kidney beans, and black chickpeas. I focused on creating an automated plant watering system. This minor project acts as a platform to learn basic engineering skills and allows an individual to get aware of the Agri-Food Industry and what they have to offer. This minor project allowed me to develop crucial skills needed in the future, such as how important it is to pay attention to detail, analyze situations, and staying determined through all design processes.

CONTEXT:

This minor project allowed me to fulfill my goal of creating an automated plant watering system. I was also able to design other features that can contribute to this project that were not originally planned. This minor project allowed me to learn some basic engineering skills that can be useful in the future when I work as an engineer. This project provided me with a foundation of basic skills that I can enhance throughout my academic and future career. A strong foundation is necessary to stand tall and withstand the forces of nature. In my case, a strong foundation is essential to complete projects and face any technical issues I encounter along the way.

TECHNICAL REQUIREMENTS/SPECIFICATIONS:

- For this project, I utilized the Arduino Board, the software platforms, Java and JavaFX, and a bean plant to create a software program.
- In order to tell the Arduino Board commands, I downloaded the Arduino software.
- The program allows the Moisture Sensor connected to the Arduino Board to detect dry soil and pump water into the plant accordingly.
- Moreover, with this program, the user can press a button to turn the water pump off and on.
- The program can also allow for the user to see current moisture levels of their plant, in my case, a bean plant, named Beantrice.
- The software program also contains JavaFX and Maven libraries.

COMPONENTS LIST:

The components and a short description of them are the following:

- Grove Board: This was used to execute this project, and send commands to do so.
- MOSFET: This was used to connect the moisture sensor and the water pump. The purpose of this is to control the voltage/current flow between sources. It is also considered as an amplifier.
- Battery Source (9V): This was used to provide power to pump water from the water supply into the plant, through the water outlet tubing.
- Moisture Sensor: This was used to measure the moisture levels of the soil. If it was lower than a certain threshold (dry), water would be pumped and given to the plant.
- Water Outlet: This was used as an equipment to pass through water into the plant. It was attached to one end of the water pump.

- Pot for Plant: This was used to allow the plant to grow. Inside the pot, there was the plant, soil and the other end of the water outlet.
- Pump in Water Supply: This was used to pump water into the plant. It was connected to a power source and the other end was connected to the water outlet tube.
- Container for Spills: This was used to contain any spills of water and soil.
- Laptop: This was used to create the software program, execute this project and was attached to the Grove Board. Various commands were sent through the laptop and into the Arduino.

PROCEDURE:

I started this project by purchasing a “Grove Beginner Kit For Arduino.” Then I decided on what plant I would grow. After asking my family what they think can grow quickly, we chose to grow beans. After that, I started to gather all the required materials for this minor project. The materials needed for the plant included: a big pot for the beans to grow in, soil, bean seeds, water, and a garden trowel. I soaked the beans in water and wrapped them up in a paper towel, which I then placed in a Ziplock baggie. I kept the beans wrapped for about five days. By wrapping the beans in a Ziplock baggie allowed for the beans to sprout and grow healthy. I filled the pot with soil and then placed the sprouted beans into the dirt with the garden trowel, ensuring to leave a gap between the seeds. I came up with the name Beantrice because the main character of my favorite television show was Beatrice. To give the plant’s name some uniqueness, I changed it to Beantrice. I added water and placed the pot with the bean seeds in an area where the sun is plentiful. I allowed the beans to grow. I downloaded the Java, JavaFX, and Arduino programs. I connected my Arduino board to my computer and coded the programs needed to fulfill my goal of creating an automated plant watering system. While I encountered technical issues along the way, I still was able to perform this goal. The problems I encountered provided me the opportunity to learn the necessary skills. I also created a program to allow for a user to press a button to turn the water pump off and on, and allowed for the user to see the current moisture levels of the plant.

TEST:

While I was testing to see if my software program worked, I made sure to test the software as I coded small amounts. I did this because it made it easier to detect any mistakes I had made, rather than keeping it to the end moment. It would have been difficult to analyze and fix errors if I had left testing until I finished coding the entire program. Java checked over my work automatically and provided me the suggestions I could do to make the code right. I would check if the program and the moisture sensor were working by comparing multiple data values. I used my plant, the air, a wet paper towel, and water to create various data points. They all mimicked the potential conditions of my plant. I would compare to see if the values were different or not. If they were different, I knew I was doing something right. I also used graphs of current moisture values when the soil was wet, when the soil was dry, and when the soil was just moist. I did this because I wanted an accurate threshold value of when the soil was dry.

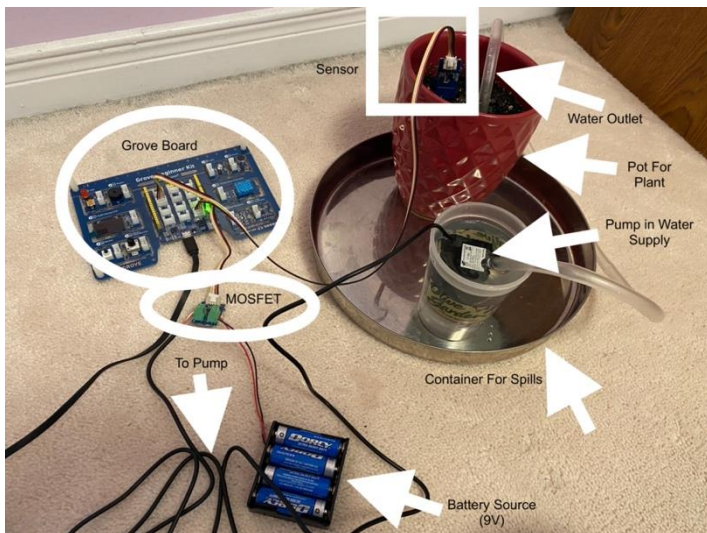
CONTINGUENCY:

I did have one idea in mind but had to execute a different one because things did not work out as hoped. Through this experience, I learned how important it is to pay attention to detail and how crucial it is to stay determined. I learned through that experience that just because things do not go as the plan does not mean that I will not be able to fulfill my goal of creating an automated plant watering system. It is crucial to replan as you go. If one thing did not work out, that does not mean that the result would

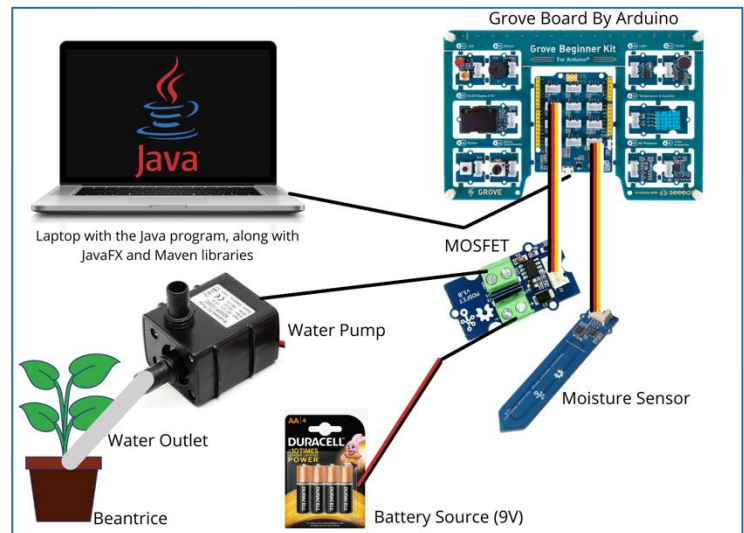
mean that the entire system would not work. It is also crucial to pay attention to detail and realize that sometimes mistakes could mean a couple of typos here and there. Next time going forward, I would like to keep what I learned from this experience in my mind. Keeping this in mind will save me from a lot of anxiousness and ensure things go steadier in the future. I would also like to keep this phrase in mind for next time, "Success is a journey, not a destination." I want to keep this in mind because it is not about the result but how an individual can overcome the challenges they face. It is also about how sometimes, one has to take an alternate route to the destination. That route could be longer and have more bumps along the way, but you will still reach the same target. I think that keeping this in mind will help me and motivate me to face challenges head-on.

CONCLUSION:

Through this minor project, I was able to successfully fulfill my goal of creating an automated plant watering system. This minor project provided me the opportunity to learn some basic engineering skills that can be useful in the future when I work as an engineer. It also allowed me to learn about how Java works. This project provided me with a foundation of basic skills that I can enhance throughout my academic and future career. I was able to combat many issues I faced. I was also able to take back some learning that I can apply in the future. I could also reflect on my learning, to fully grasp the concepts and think about what I learned about upon completing this project. I am very grateful that I could be a part of the project and learn so much throughout this experience!



COMPONENTS: A photo of the system



TECHNICAL REQUIREMENTS: Schematic Drawing