Project Deliverable F

Prototype I & Customer Feedback

Date: March 7th, 2018

SUBJECT: FEASABILITY OF SOLVING MOBILITY AND WATER RESEVOIR DETECTION ISSUE

# Summary

Our group have investigated possible methods to increase the mobility of the plant container of the hydroponic system, and to develop an easy to use method of determining the water level of the device’s reservoir. The adoption of a plastic, and modular container may eliminate the mobility issue, while a microcontroller-controlled sensor can signal the water level with only a small increase in cost.

In order to investigate the feasibility of the aforementioned solutions, a prototype which focuses on these areas of the design will be constructed.

# Introduction

This document is a response to a request by Growing Futures Team, requesting the development of unspecified improvements of there hydroponic system. Interviews of the client, and users, have yielded the most significant areas of focus to be the difficulty with transporting the plants, detection of the water reservoir level, and the cost of the device.

While utilizing the Design Thinking method, our group has chosen to solve these issue by installing a ultrasonic distance sensor onto the water level, which will indicate one of three LED indicator lights, dependent on the water level. Furthermore, to increase mobility, switching the plant container to a lighter, and cheaper plastic material may increase mobility, and reduce cost. Many similar systems have adopted plastic containers, and electronic sensors to eliminate the issue.

To determine if the concepts would be a beneficial solution for the issues, our group have constructed a prototype of the main body and preliminary code of the micro-controller, The results of this prototype will offer data that may allow the comparison to other viable solutions.

# Successful Solution Analyses

Using a plastic material instead of the metallic has should reduce the cost of the plant container. The plastic incurs the cost of $7.99 per three-meter piece purchased.

The materials used in the current system, and the price of the materials was not known by the client, however, our group has inferred from the images provided that a metallic, probably aluminum, material was used. From our research, we have determined that the cheapest of metallic material costs approximately $20 per three-meter piece of similar design. Thus, for the container body, a successful prototype should have a three-meter length a material costing less than or equal to $20.

Without knowing the material used, the exact weight of the current system is not known. However, by the complaints about the immobility of the material, one can assume that it is heavy, and large in volume. To achieve success, the prototype should have a small enough weight and size for a ten-year-old child to carry comfortably. The height of each pillar thus should be no more than one meter, where as the weight should be less than fifteen pounds while empty.

Successful preliminary programming of the prototype, should yield the ability to control the clock pulses of the microcontroller, and toggle a test indicator LED within a controlled delay. Most components of the circuitry work by sending pulses by specific delays or determine the time of the delay between received pulses. This, a simple instruction to toggle an LED should yield the feasibility of the greater controls.

# Prototype Design

## Plant-Container Body

The Prototype Design of the plant container will be constructed by using a length of plastic gutter material. The length will be cut into four pieces, three equal lengths, one length equal to the size of the combined three widths. The last piece will be used as a container for the three lengths, which will secure them, and act as a funnel to drip the nutrient-water mixture into the reservoir.

## Microcontroller Programming

The microcontroller selected will be a PIC12F683, which will be wired to a LED on its GR0 Pin. The code should control the 8 MHz timer to send an interrupt when a compare-flag is set after the to be calculated interval of time has elapsed. After the number of multiples of interrupts occurrences required for one second of elapsed time, then the code will logically toggle the LED.

# Schedule & Budget

The cost of the prototype is only the cost of the plastic gutter material, the cost of the microcontroller. A budget analyses has determined that the gutter material shall cost $8, and the microcontroller costs $0.30.

The only tests to be run on the prototype is to observe if the LED toggles by one second intervals, and to weigh the plant container. A schedule is not necessary to plan these tests, as all that is required is to cut the gutter material, and program the microcontroller. By programming the controller, the observations will be made implicitly. And the weight of the gutter can be measured without appointment.

# Conclusion

The initial prototype of the design will be inexpensive, and require little time to construct or test. However, valuable information regarding the feasibility and success of the chosen solutions will be gathered.