CSC 431

Plant Power

Software Requirements Specification (SRS)

Team #15

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Version History

Version	Date	Author(s)	Change Comments
1	2/22/2021	Dylan, Jorge, Dominick	Added functional and non-functional requirements, language constraints, as well as budget and schedule requirements.
2	3/4/2021	Dylan, Jorge, Dominick	Added more functional requirements, non-functional requirements, network constraints, Edited and Detailed explanations.
3	4/25/2021	Dylan, Jorge, Dominick	Fixed issues that were commented on by the grader.

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Plant Power Requirements

1. System Requirements

1.1 Functional Requirements

1.1.1 Track / Log Data

Title	Track and Log Data

Description	The system must track the plant's conditions and automatically log them. The conditions to be measured are light intensity, temperature, humidity, pH, and electrical conductivity.
Priority	0
Precondition(s)	We must have the adequate sensors and hardware (Arduino MKR wifi 1010: IoT microcontroller board to control sensors, Arduino MRK ENV shield: attachment for board to add environmental sensors such as light intensity, temperature, and humidity)
Basic Flow	Users can connect the board and shield, attach to the plant's environment, and begin collecting data on conditions.
Postconditions(s)	The user now has conditions of the plant's environment logged onto a data sheet, ready to be displayed.

1.1.2 Display Conditions

Title	Display the analyzed data
Description	Display the analyzed data on a webpage. This would be displayed through graphs and allow for an easy user experience.
Priority	0
Precondition(s)	Need to setup a webpage, and then transfer the data neatly into the webpage for displaying
Basic Flow	Users can open the web page, and will be presented with their plants. They can click and navigate through to find detailed graphs about the plant statistics, and find the recommendations calculated.
Postconditions(s)	Users can take the knowledge given to them, and adjust plants as told.

1.1.3 Analyze Data

Title	Analyze data through machine learning
Description	Take the data derived from the sensors and apply machine learning to calculate progress and determine optimal conditions
Priority	1
Precondition(s)	Data needs to be properly stored that is acquired from the arduino.
Basic Flow	Data is taken from the database, and a machine learning algorithm is applied, results are then supplied.
Postconditions(s)	Results will be sent to the display.

1.1.4 Log In

Title	Log into the web page
Description	Allow the user to login to their webpage that has their specific plants and data stored
Priority	3
Precondition(s)	Account info must be stored by utilization of firebase web service
Basic Flow	Username and password is entered into the page to allow the user to log into their own portal.
Postconditions(s)	Plant profiles and tool page opens
Use Case Diagram	3.1.1 User Flow Diagram

1.1.5 Plant Profiles

Title	Plant profiles viewed through web page
Description	The plant profile page will host the displayed data in an organized fashion and allow the user to cycle through plants and see each of their data and analyzations
Priority	2
Precondition(s)	Data needs to be tracked and stored
Basic Flow	Data and graphs are taken and put into separate pages, and the user will be able to click buttons to cycle through and select either one.
Postconditions(s)	User can see their plants and or can analyze a specific one
Use Case Diagram	3.1.1 User Flow Diagram

1.1.6 Add and Edit Plant Profiles

Title	Add and Edit plant profiles
Description	Allow the user to add a new plant that will be tracked or edit a specific one by either deleting it or renaming.
Priority	2
Precondition(s)	Data, webpage, must be set up
Basic Flow	Users will be able to hit an add button to create a new profile and link that to that data and or edit an already created one to change its link, change name, or delete.
Postconditions(s)	A new profile will be added to the plant profiles page.
Use Case Diagram	3.1.1 User Flow Diagram

1.2 Non-Functional Requirements

1.2.1 Data Transfer

Title	Data Transfer
Description	This NF requirement specifies that the data is transferred from the back end to the front end efficiently. It ensures that we use a proper data storage location (SQL, Arduino Cloud, Excel sheet, etc) which will then be connected to the front end website where the user will see their data displayed neatly.
Priority	1
Applicable FR(s)	1.1.1 Track / Log Data, 1.1.2 Display Conditions

1.2.2 Automatic Adjustment

Title	Automatic Adjustment
Description	Once the data has been collected, displayed, and analyzed, the system will be able to use the results to adjust itself and stay within the optimal conditions (pH range, temperature range). The sensors on the system will be providing the data to the hardware that will provide a pH Up or pH down solution to adjust the pH based off of if statements with constraints on the data. If the pH goes above the threshold, it will add drops of pH down until it falls back below the threshold. If the temperature goes above the threshold, there will be a fan that becomes activated to cool the plant.
Priority	2
Applicable FR(s)	1.1.3 Analyze Data

1.2.3 Seamless View

Title	Seamless View of plant profiles
Description	Once plant profiles are created they will be placed seamlessly into the webpage by storing them as a list, so that users can scroll through them.

Priority	2
Applicable FR(s)	1.1.5 Plant Profiles

1.2.4 Connection of Profiles to Data

Title	Connection of Profiles to Data
Description	Profiles will be connected to data when a user creates a new profile by having an API request to our data source which lists the data by plants, so that the user can select that certain plants data.
Priority	2
Applicable FR(s)	1.1.6 Add and Edit Plant Profiles

2. System Constraints

2.2 Language Constraints

2.2.1 JavaScript

Title	Javascript within React
Description	Javascript will be used within the React framework for the frontend.
Priority	0

2.2.2 SQL

Title	SQL and mySQL
Description	SQL will be used for the collection and distribution of data
Priority	1

2.2.3 Python

Title	Python for scientific programming
Description	Python will be used for the machine learning and analyzation aspect of the data
Priority	1

2.2.4 Arduino version of C++

Title	Arduino version of C++
Description	The code for the Arduino sensors is written in the framework that Arduino made build on top of C++
Priority	0

2.3 Platform Constraints

2.3.1 React for Website

Title	React for Website
Description	The main platform will be a website built on the React platform, an open-source, front end, JavaScript library for building user interfaces or UI components

Priority	0

2.3.2 Arduino Create Environment

Title	Arduino Create Environment
Description	The sensors and Arduino microcontroller are managed in Arduino Create, an online platform with a built-in IDE as well as the IOT cloud, used to handle variables for the sensors and deploy the code to them.
Priority	0

2.4 Hardware Constraints

2.4.1 Arduino Board (MKR Wifi 1010)

Title	Arduino Board (MKR Wifi 1010)
Description	The microcontroller board that we will be using to take preliminary data is the Arduino MKR Wifi 1010
Priority	0

2.4.2 Arduino Sensor (MKR ENV Shield)

Title	Arduino Sensor (MKR ENV Shield)
Description	A shield that attaches to the MKR Wifi 1010 board that contains sensors to track the following conditions: atmospheric pressure, temperature and humidity,

	ultraviolet UVA intensity, ultraviolet UVB intensity, UV index, and light intensity.
Priority	0

2.5 Network Constraints

2.5.1 Firebase Web Service

Title	Web Service through Firebase
Description	To allow for the website to be publicly shared, we will host the website through firebase. A tool that allows you to start hosting a small website and scale as needed.
Priority	3

2.6 Deployment Constraints

2.6.1 Packaging

Title	Packaging
Description	The arduinos have to have a sufficient level of protection in the packaging to avoid them or any hardware from breaking during shipment and delivery. The software must be bundled in as well.
Priority	0

2.7 Budget & Schedule Constraints

2.7.1 Arduino and Sensors

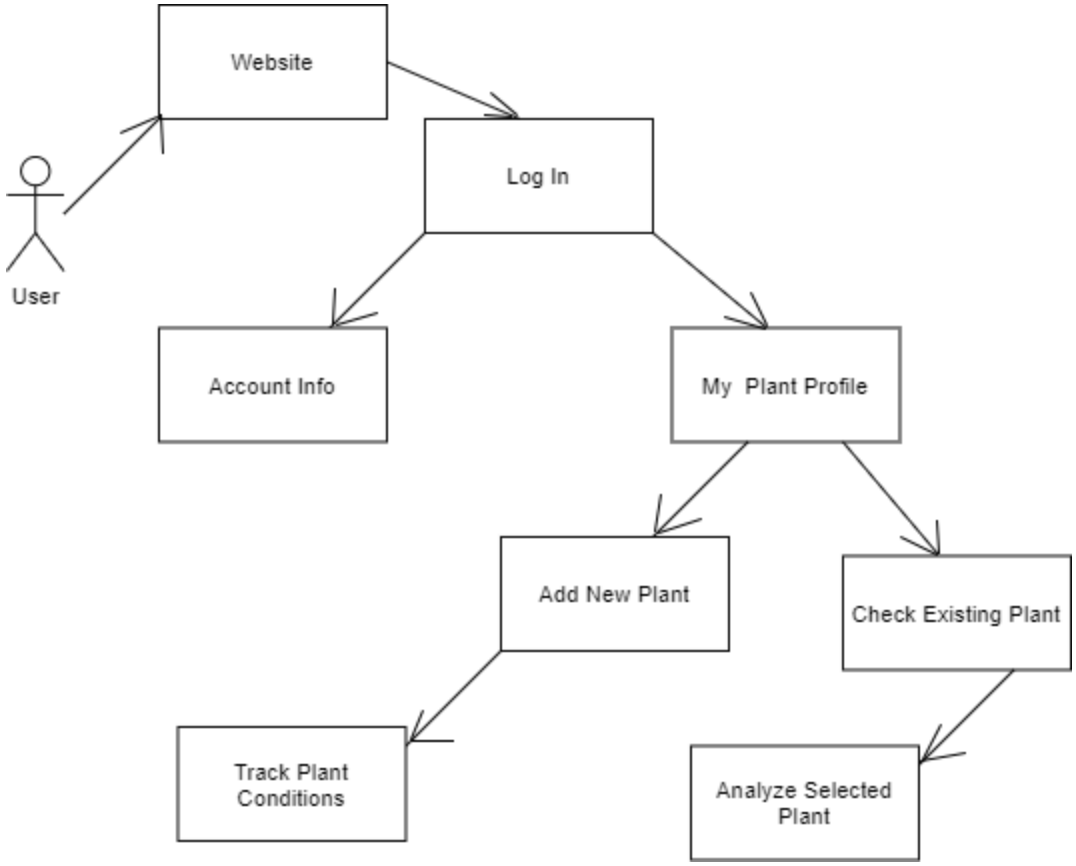
Title	Purchase of Arduino and Sensors
Description	Arduino and sensor kit used for collecting data. This would be less than 100 dollars, and the only hardware we would need currently
Priority	0

2.7.2 Website Hosting

Title	Purchase of website hosting service
Description	The website could be hosted with an official domain name to release publicly for a monthly price, or could inquire of the university for use of a server.
Priority	2

3. Requirements Modeling

3.1.1 User Flow Diagram



4. Evolutionary Requirements

4.1 Functional Requirements

4.1.1 Global Database

Title	Global Database
Description	Allow for a global database that can be edited by any user, and have separate databases for each account created.

Priority	5
Precondition(s)	Need to first create a version with our own small database
Postconditions(s)	Allow for more efficient rollout

4.2 Non-Functional Requirements

4.2.1 Scalability

Title	Scalability
Description	The system must be designed in a way so that it can be easily scaled up and down. The preliminary design will be for an at home grower / user to connect to, but there will be options for the addition of multiple sensors and boards into the website and system so that it could be brought to a large scale growing operation such as a company farm.
Priority	5
Applicable FR(s)	4.1.1 Global Database