Software Requirements Specification

for

Indoor Hydroponics Farming system with IOT

Prepared by

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1. Introduction

Agriculture plays an important role in the development of many nations including India but it is associated with several other difficulties like weeding, manures, pesticides, and chemicals that are required for the agricultural process.

The hydroponic system that has been developed demands soil-less, nutrients and less work space. This system provides quicker growth of the plants, much stronger yields with the utmost quality. In the process of hydroponics, many factors like the pH, temperature, humidity, etc., are needed to be monitored and operated. In this paper, considering the yield and the growth of plants, an efficient approach is provided for the accurate growth of plants with less water usage and minimum need of nutrients using IOT based techniques.

1.1 Purpose

The main purpose of implementing an IoT technology in alternative farming practices has been substantially pursued to help in reducing crop production efficiencies and improved performance . This implementation successfully reduces food production's inefficiency and helps further increase the food market due to IoT systems' capabilities to connect smart technology in crop plantation.

This development of an automatic indoor vertical hydroponic farming system is made up of three elements

1st. An indoor planting module with IOT enabled controller.

2nd Various types of plant sensors are used to make it automatic and can be monitored only by using mobile applications and

3rd A cloud-based system developed using ThingsSentral platform as a data server is used to store, collect, and receive information from users and plants themselves.

1.2 Document Conventions

This document uses the following conventions.

pH potential of hydrogen

EC Electric Conductivity

OLED Organic Light Emitting Diode

DHT Digital temperature and humidity

2FA Two factor Authentication

LDR Light Dependent Resistor

OTP One-Time Password

1.3 Intended Audience and Reading Suggestions

This project is a prototype for the indoor hydroponics system and it is restricted within the college premises. This has been implemented under the guidance of college professors. This project is useful for the hydroponics farmers.

1.4 Product Scope

The scope of this project helps us in identifying important empowering retailers for the IoT paradigm. Hydroponics With IoT gives better results not only when the nutrient solution monitoring is done but also its management has to be implemented. The water base system can be completely automated so the farmers need not be present every time to ensure the high-quality crop. and notifying the user to take action whenever needed. With the advancement and quick adaption of new techniques of growing we can see cost differential is reducing. We can see rapid progress in growth of plants when farmers will adopt new technologies like hydroponic farming. So, in future, hydroponics will increase in urban areas and even when it is combined with the Internet of Things. By using hydroponic technique space problems in India will be solved in future.

1.5 References

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2. Overall Description

2.1 Product Perspective

Indoor farming goes a step further, minimizing the impact of the external environment on plant growth. The biggest advantage of hydroponic farming is that vegetables grow fast, grow well, have no pesticides, avoid heavy metal pollution, and avoid the threat of weather and pests. This is truly green and organic.

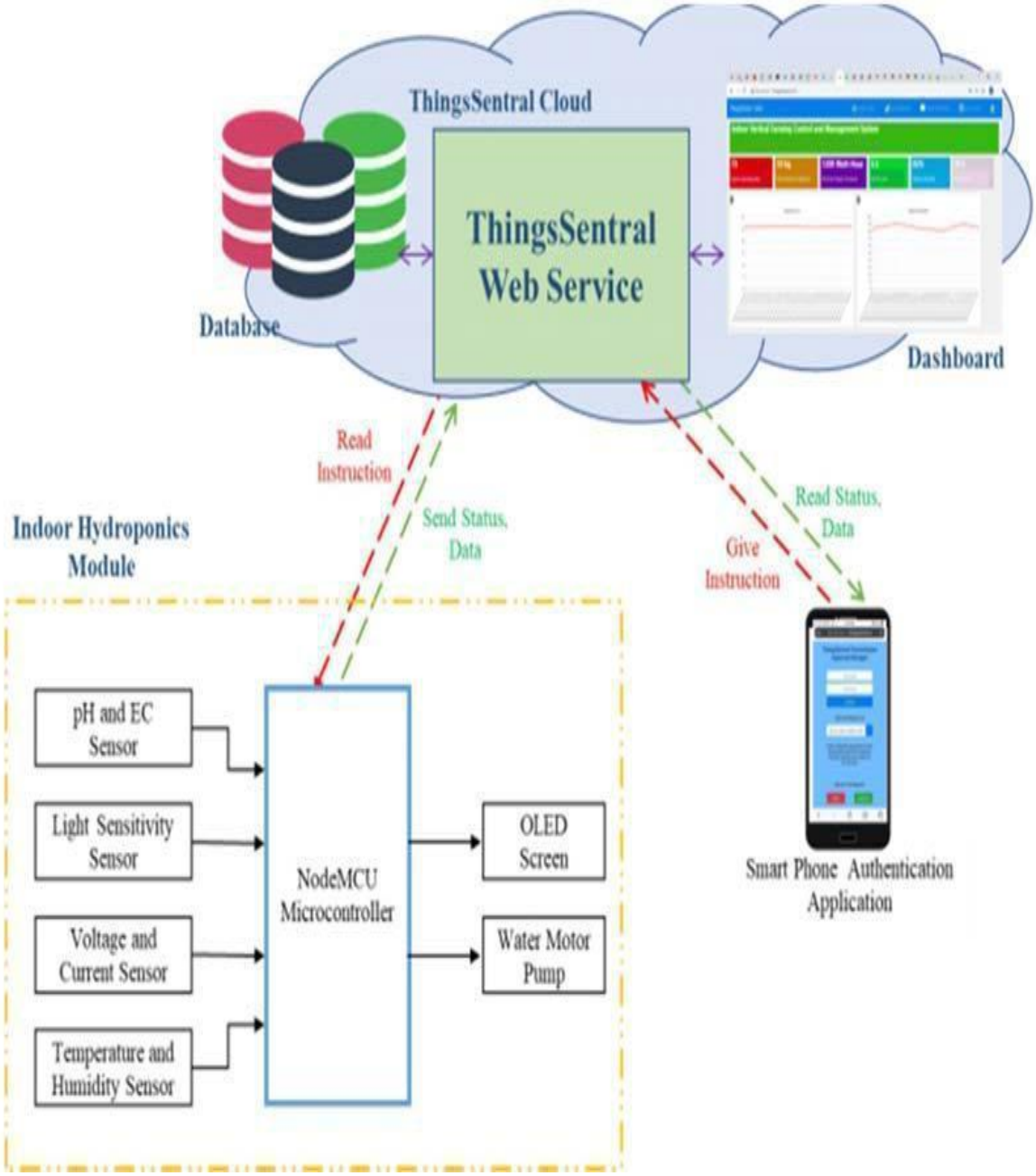
2.2 Product Functions

For the controller for use for developing and tracking the indoor vertical hydroponic farming gadget, a look at changed into made on how different humans use the hydroponic systems. Besides, this proposed gadget makes the hydroponic gadget clean to take care of. The general design of the system with a 2FA method can be used as multiple security.
The general design of an indoor vertical hydroponic farming system with a 2FA method can be seen in **Fig 1** below.

- From the block diagram, there are three main parts, namely the input, controller, and output.
- At the input section, all sensors are connected to the NodeMCU.
- On the controller side, the use of a Node microcontroller plays an important role in securing the input to output and input to the cloud database. Indeed, NodeMCU acts as a WIFI chipset to send information over the Internet.
- On the output side there is a relay as a switch for the water pump motor.

In addition, there is an OLED display as an indicator to read data directly from the sensor. The Android or IOS application is also placed on the output for the user to use. Double security is done by smartphone by entering the code as a confirmation PIN on the breeding system and confirming the access to upload the breeding data to the server.

2.3 Architecture



2.4 Operating Environment

ThingsSentral Server Application

ThingsSentral is a cloud-based IoT platform developed by the National University of Malaysia (UKM). Figure 8 shows the ThingsSentral application interface. Users can use the platform to create their own cloud-based IoT systems that can be used to collect, store, and retrieve data. This system platform uses the HTTP protocol over the Internet. It is possible to send data from or to hardware microcontrollers such as Node MCU, Raspberry Pi and others. Channels containing data fields, location fields, and status fields are key elements of how ThingsSentral works.

2.5 Design and Implementation Constraints

1.An indoor planting module with IOT enabled controller.

2. Various types of plant sensors are used to make it automatic and can be monitored only by using mobile applications.

3. A cloud-based system developed using ThingsSentral platform as a data server is used to store, collect, and receive information from users and plants themselves.

2.6 Assumptions and Dependencies

Let us assume that this is a indoor hydroponics system and it is used in the following application:

- Vertical farming is a relatively effective way to produce a crop using an environmentally friendly agriculture system.
- The implementation of IoT technology in alternative farming practices.
- This implementation successfully reduces food production's inefficiency and helps further increase the food market due to IoT systems' capabilities to connect smart technology in crop plantation.

3. External Interface Requirements

3.1 User Interfaces

- Organic light emitting diode display module

3.2 Hardware Interfaces

- NodeMCU microcontroller module
- Indoor vertical hydroponics farming system
- Potential of hydrogen and electrical conductivity sensor
- Temperature and humidity sensor
- Light sensitivity sensor
- Voltage and current sensor

3.3 Software Interfaces

- ThingsSentral server application
- Two factor authentication (2FA) method

3.4 Communication Interfaces

- *The NodeMCU requesting to transmit and receive data over the Internet through the ThingsSentral based web module.*

4. System Features

- *This implementation successfully reduces food production's inefficiency and helps further increase the food market due to IoT systems' capabilities to connect smart technology in crop plantation.*

- *Strengthen network security*

- *The user or owner of this farming system can access the information about their plants anytime and anywhere. They can get the information by using a computer or mobile device that is connected to the internet.*

- *A web-based application allows users to view and monitor their plants in real-time. This web-based application will also have clear information, with the help of graphics and figures.*

- *soil-free culture with nutrient solutions, this cultivation technique involves growing plants.*

- *Free from pesticide*

- *Conserve water*

- *Produces Higher Quality Food*

- *Quick plant growth*

5. Other non functional requirements

5.1 Performance Requirements

- Internet connection is required
- Free from Virus

5.2 Safety Requirements

- Check the connection of water pumps
- The hardware tools safety
- Secure the Application

5.3 Security Requirements

The 2FA is an authentication system that facilitates verify someone's identity if whatever is valid for the man or woman to access. In general, upon login or get right of entry to requests, the 2FA method is used. two out of 3 variables are used on this system. in keeping with Fred B. Schneider, something the person knows, something the person has, and something inside the consumer are the variables used in authentication .

5.4 Software Quality Attributes

- More Secure –The application is more secure due to use of 2FA
- Transaction Support -Data is transmitted and received through internet through the web application
- Performance–usage environments by restricting the network traffic to performance tier traffic