

GroWiser: A Plant Recommendation and Monitoring System

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ABSTRACT

Climate plays an important role in the growth of plants and their distribution. Environmental factors can limit the growth and distribution of a plant if they are less than ideal. Environmental stresses are sometimes the cause of plant problems. Lack of sunlight and excessive water can cause direct damage to plants. Furthermore, most people fail to get the intended results when planting because they do not have sufficient knowledge of plantations. Taking into consideration the need for a suitable plantation, GroWiser is a system of mobile and web applications. Through these applications, users can receive recommendations for plants according to their environment and monitor their plants after they are planted. GroWiser also offers an e-commerce store, which ensures the availability of recommended plants.

Keywords: Ecommerce, Monitoring, Machine Learning, Recommendation.

INTRODUCTION

The environment plays a crucial role in plant growth. Environmental factors can limit the growth and distribution of a plant if they are less than ideal. Environmental stresses are sometimes the cause of plant problem. Some unfavorable growing conditions (e.g., too little water) cause direct damage to plants (Haferkamp, 1988). Most people fail to get the intended results when planting because they lack sufficient knowledge about plantation and they do not fulfill the plant requirements that plants needs to grow due to which plant does not grow well. Moreover, people either forget to water the plant or overwater them, which leads them to die. Therefore, there is a need for an automated solution as a remedy of all these problems. (Sadia Mughal et al., 2019) Presents the context-aware based remote sensing network for indoor ecological observing at home. Their framework consists of two sections. In the initial section, the environment within the enclosed territories is monitored, including light, temperature, pressure, and humidity. A warning was given about toxic substances. The second section aims to identify several indoor plants that can decrease pollution levels in the indoor air to a certain extent. (Kim et al., 2021) Provide a method that enables users to intelligently manage the plant system at any time and from any location. Temperature, humidity, light intensity, and soil moisture are used to examine a plant's general health and its requirement for water. The suggested system uses Internet of Things (IoT) technology to monitor soil moisture and warn the device anytime it becomes dry so that irrigation may be scheduled appropriately. They basically built a "smart plant" by using hardware devices to measure the aforementioned criteria. (Dhamecha et al., 2021) A data-mining architecture helps him determine the appropriate temperature and plants for a given area. By using GPS, the system determines the user's location in terms of verticals and latitudes. In order to find the client parameters for that particular location, the author uses the Weather Forecast API. A key reason to choose open weather map among different APIs is that it compares historical measurements of the current month with climate. (Si-Moussi et al., 2019) To handle the plant recommendation task, the authors investigate two neural network architectures that are inspired by Grinnellian and Eltonian niches. The first proposal relies on environmental rasters and convolutional neural

networks for advanced feature extraction. Second, the co-occurrence of plants and organisms is determined from a list of taxa curated by experts. The task organizers provided about 280K observations from the Global Biodiversity and Information Facility. It consists of training a model that predicts the dominant plant species at a geographical location based on images produced by the smartphone application Pl@ntNet in 2017 and 2018. It is formulated as a multi-class classification problem where the output class is the dominant plant identity. For this task, they evaluated the GrinnellNet and EltonNet architectures. For training, they sampled 80% of the data and kept 20% for validation. After accuracy prediction it turns out that GrinnellNet performs much better than EltonNet. (Zambre, 2021) Proposed a system that uses microcontroller on Arduino and IOT which enables users to remotely monitor the status of water motor by getting approximate information from sensor. Humidity, moisture, and temperature sensors are placed in the root zones of plants as well as a gateway unit (ESP8266) that monitors the sensor information and transmits it to an Android application. In order to control water quantity, this application measures approximate values of temperature sensor, humidity sensor, and moisture sensor programmed into a microcontroller.

The above-mentioned researches are done on either Plant Recommendation or Plant Monitoring and Irrigation system and do not present a holistic framework for plantation. This paper proposes GroWiser as a smart method of filling the knowledge gap that a normal plant owner or gardener has about plantation, such as recommending the right plant for the user-defined location, providing hardware to monitor the plant soil moisture level, and an e-commerce store to buy plants from nurseries. With GroWiser's recommendation module, you can determine which plant is most suitable for your environment. GroWiser Plant Monitoring is based on hardware that notifies the user on the GroWiser mobile application when it's time to water the plant. GroWiser Nursery Panel is a multi-vendor e-commerce store for nurseries that do not have their own official website. They will be provided with a list of plants and if they have more plants, they can contact us and our team will add those plants to our data.

OBJECTIVES

The main objectives of GroWiser includes:

- To achieve a solution avoiding wrong plantation that will adversely affect the environment.
- To build an ecommerce store for our nursery's collaborators.
- To build an application that give recommended plants list on the basis of temperature and humidity.
- To attain a solution that will monitor the plant growth.

METHODOLOGY

This section discusses our system development processes, tools, and procedures.

Dataset Collection

GroWiser's recommendations are based on plant data. As of now, there is no resource through which we can obtain information about plants that grow in Karachi, Pakistan. In order to collect plant data, we decided to use online plant websites e.g. thespruce.com.

Workflow

Figure 1 presents the architecture of GroWiser that is based on APIs build on Laravel. The users can login through GroWiser mobile application and can use any proposed module (plant recommendation module and monitoring module) through controller APIs. If the user wants to use manual plant recommendation the system requires input and send it to an Expert system to generate plant recommendation list. Plant monitoring requires GroWiser hardware, consisting of two sensors: A temperature & humidity sensor and a soil moisture sensor.

Temperature, humidity, and soil moisture values are sensed by the hardware and a notification alert is sent to the user as soon as the plant needs water as shown in Figure 1.

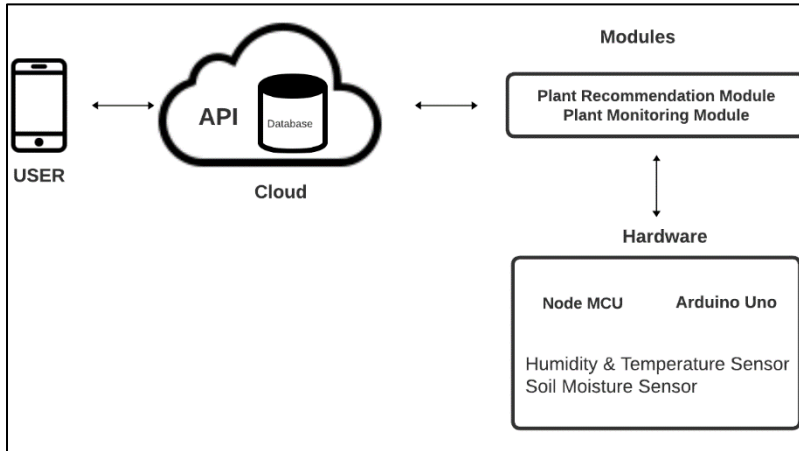


Figure 1. System Architecture.

GroWiser Hardware Part

The Plant monitoring module of GroWiser includes a hardware circuit. As shown in Figure 2, it consists of two sensors (Temperature & Humidity and Soil Moisture), Arduino Uno, and Node MCU (an open-source IoT platform). To monitor moisture continuously in the soil, soil moisture sensors will be placed in the soil, and the readings from these sensors will be compared to the stored data. Whenever the moisture level of the soil for a particular plant decreases, the GroWiser mobile application sends an alert to the user to water the plant.

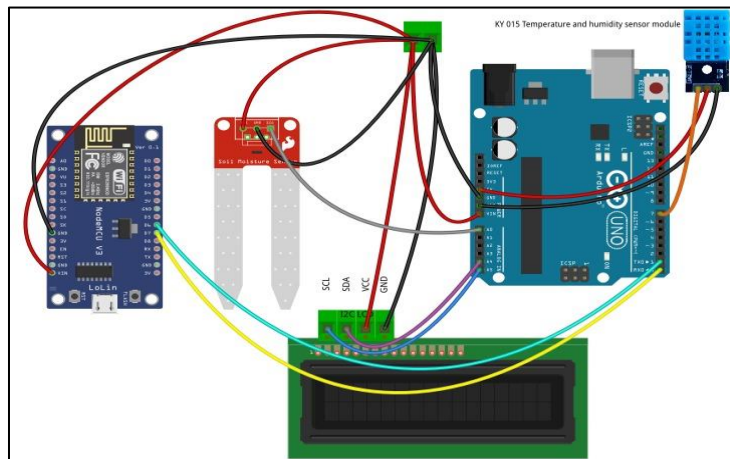


Figure 2. Circuit Diagram.

CONCLUSION

GroWiser is an innovative solution for people who fail to get the intended results when planting because they do not have sufficient knowledge of plantations. Plants depend on the environment for growth, so unfavorable conditions, such as too much water, can damage them. Using this solution, users can plant according to their environmental conditions, e.g. Aloe Vera plants cannot grow in low-temperature areas. It will allow users to monitor their plant’s health and notify them when to water the plant, reducing overwatering, and users will be able to buy the recommended plants from nurseries using GroWiser e-commerce store.

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