Chapter 12

Smart Housing Life: Plantino

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Abstract

Watering plants are a part of the chores presented in gardening, but many plant lovers and gardeners failed to fully understand what goes on in and around the plant when watering. Surrounding temperature and humidity plays a major role in inducing an optimum plant growth. With the presence of Plantino, it satisfies all these aspect in producing an optimum environment for the plant. The main objective is to simplify the human life. Thus, implement a library that contains most of the plant species. Hopefully, this project may bring convenience to the user by knowing the plants' need. Simplicity of human life in terms of better understanding the humidity and other critical factors needed in order to make growth possible. In addition, this project also for children in purposed of teaching and learning. This to attract and interact with the children to make learn of gardening is fun and important to conserve the nature.

Introduction

Water is a primary element for successful production of plants. A sufficient water supply is essential in keeping the soil moisture for the optimum growth of a plant. Apart from water, there are several aspects of environmental factors that control the better growth of plants such as light intensity, temperature as well as relative humidity. Most people do not aware of the requirements of such elements that promote the plants growth and facing challenges in nurturing them as healthy plants. People are busy with their working life are not attentive of the insufficient elements for their plants which in turn ruin the growth of the plants. Therefore, Plantino which is a smart housing product was developed to ease the plant lovers to encounter such challenges they are facing in growing healthy plants at home. Plantino yields convenience to the peoples mostly who are beginner in gardening or who have a small size garden. The smart housing product with the embedment of green technology is a wise gardening system that makes the users aware of the state of the plants at their garden. Plantino is incorporated with four sensors that sense soil moisture, humidity, temperature and light intensity. Plantino collects and examines the data about changing in humidity, temperature, light intensity as well as the soil conditions and disclose the state of the plants to the users through the Plantino app, give alerts and indications to them to elevate the healthiness of the plants. With the sensor technology and instinctive design, the Plantino smart housing product continually associates the users with the plants in their garden for the purpose of growing healthier plants.

Development of Plantino Smart Device and Mobile Application

a. Mobile Application: Plantino app

The Plantino app displays the data of the plants states in a real-time to the users. Along with the data, it provides suggestions on what the users should do to enhance the plant health. The Plantino app shows the existing conditions of the plant and the data tracked by the smart device on humidity, temperature, light intensity and soil moisture level are analyzed and cross referenced with the data in the database and as a result advises to improve the condition of the plants are suggested based on the information on sufficient requirements for the particular plant. The users should take immediate action in accordance with the suggestion provided to enhance the growth of the plants. With a wide database, the Plantino app also assists the users in deciding the plants they wanted to grow by sharing information on optimal growth requirements for a plant. The user interfaces of the Plantino app are demonstrated in Figure 1, 2 and 3. Figure 1 shows the main page of the Plantino app which exposes the users with the introduction and details of the smart device and Plantino app. The Plantino app is integrated with the smart device through Bluetooth which transfers the data monitored with the sensors to the app and are displayed as in the snapshot Figure 2. Figure 3 shows the interface of the Plantino app which facilitates the users with the information for optimal growth requirements of other plants in the databases.

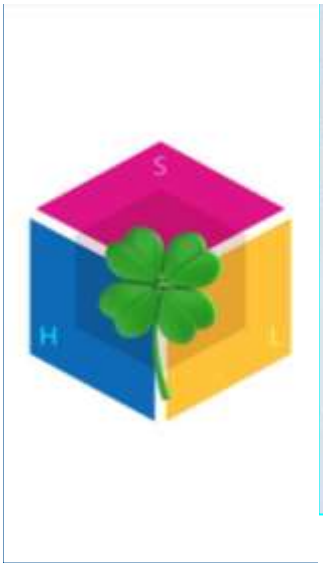

Fig. 1 Main page of Plantino app

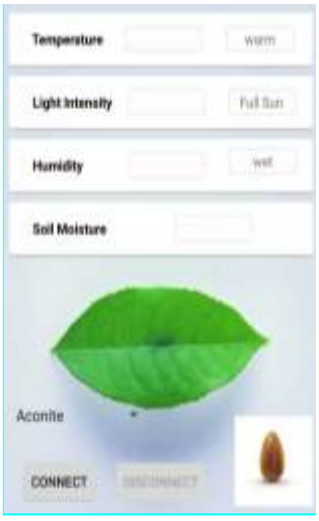

Fig. 2 Main features of Plantino app

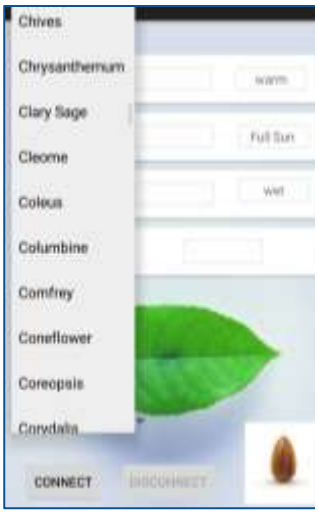

Fig. 3 Choices to change plant types

b. Plantino Smart Device

The Plantino smart device is designed with Bluetooth function and with the applications of sensors. The smart device integrated with the Plantino app over the engaged Bluetooth. Inserting the smart device in soil, the incorporated sensors detect the level of soil moisture, change in humidity, temperature and light intensity. The soil moisture sensor traces the degree of moisture in the soil and measuring the moisture level is essential in growing healthy plants as water is salient for effective photosynthesis, respiration, transpiration and transportation of nutrients through the plants. The soil moisture sensor controls and sustains the moisture of soil by notifying the users with alerts through

the Plantino app to take immediate action if the soil condition is too dry or too wet. Along with the soil moisture, the smart device traces the alterations in environmental factors such as light intensity, temperature and humidity surrounding the plants in the garden. The light intensity sensor detects the strength of the light the plants exposed to. Light is a significant environmental influencer of plant growth as the photosynthesis and phototropism process requires adequate light sources (Phonguodume et al., 2012). Certain plants only require low light intensity for the optimal growth and might ruined if exposed to high light sources. Hence, each plant demands different light conditions for healthier growth (Pan and Guo, 2016). The Plantino smart device with the light intensity sensor traces the condition of the light projected onto the plant and advice the users to adjust the intensity level of light source either by providing artificial lighting in case of presence of limited sunlight or confine the light intensity for those plants requiring minimal light source. The humidity sensor detects the atmospheric moisture surrounding the plants by measuring the quantity of water in the air. Better plant growth literally associated with atmospheric moisture level. Along with the humidity, the Plantino smart device traces the temperature of the atmospheric air. Optimum temperature is required for ideal photosynthesis and respiration and each plants demands different optimum of temperature for better growth. The Plantino app informs the changes in the atmospheric temperature and alerts the users to take proper actions in accordance with the suggestions.

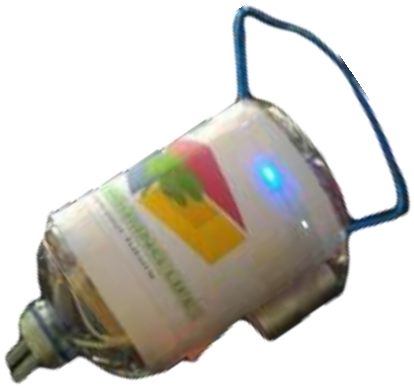

Fig. 4 The prototype of Plantino Smart Device

Plantino Details

a. Usefulness

The smart housing product, Plantino with smart device and Plantino app act as a smart gardening system which ease the plant lovers by notifying the conditions of the plants in their garden by detecting the soil moisture, relative humidity, atmospheric temperature and light intensity, the essential elements for the healthy plant growth. The data tracked are notified to the users with the Plantino app which is connected through Bluetooth to ensure them to perform a proper action to improve the current state of the plants. In addition, the database provides the users with the optimal growth information of particular plants.

b. Commercialization Potential

The Plantino is an affordable wise gardening system which monitors the plants in the garden and integrates the users in real-time and capable of simplifying manual labor of agriculture. This smart housing product has a vast potential in the agriculture field as it assures better plant growth as well as

remarkably diminish the utilization of water as it only requires the users to provide water when the soil demands water supply. The potential customers who can use the smart housing product, Plantino are the homeowner, gardener, agriculturist, and forestry department.

c. Novelty

With the employment of smart technology, the Plantino utilize cloud computing to store the vast information of plants' optimal growth requirement on online database. Furthermore, the smart device is integrated with the Plantino app with the application of Bluetooth technology in order to display the data traced on the conditions of the plants and notify the users with the suggestions on immediate actions after cross referenced the traced data with the information in online database with the employment of Arduino technology.

Conclusion

The smart housing product, Plantino incorporates sensor, Bluetooth, and Arduino technology to ease the plantation process for plant lovers as well as gardeners. It continually integrates the users with their plants in order to maintain a healthy garden as well as contributes knowledge on optimal growth information for the users. As for the future work, the Plantino will be tested on usability in selected kindergarten for teaching and learning purpose and more plants type information will be added to the database. In addition, automatic watering system will be added to the smart housing product to supply water automatically depending on the data gathered through the sensors. This project hopes that the implementation of Plantino can help to conserve our biodiversity.

Reference

Pan, J., & Guo, B. (2016). Effects of light intensity on the growth, photosynthetic characteristics, and flavonoid content of Epimedium pseudowushanense BL Guo. *Molecules*, *21*(1475), 1–12. https://doi.org/10.3390/molecules21111475

Phonguodume, C., Lee, D. K., Sawathvong, S., Park, Y. D., Ho, W. M., & Combalicer, E. A. (2012). Effects of Light Intensities on Growth Performance , Biomass Allocation and Chlorophyll Content of Five Tropical Deciduous Seedlings in Lao PDR. *Journal of Environmental Science and Management*, *1*, 60–67.