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Smart home gardening system using internet of things (IOT) platforms

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ABSTRACT

In the current era of technological development, all human activities use information technology to facilitate all our daily activities. Among the activities that use the development of information technology is gardening activities at home and in the nursery. Many people invest in gardening, but they fail to maintain it while on vacation or often forget to water the plants cause plants will wither and die. The main objective of this system development is to facilitate farmers to manage and monitor their farms in an effective manner. This system will be helping farmers to manage plants efficiently and effectively also makes it easier for farmers to water the plants with sufficient water based on the needs of the plants. The scope is to produce a project through a sensor to detect soil moisture which is used as an indicator in the process of watering the trees and provide the ability to regulate soil moisture and control the watering process by using an automatic system to on/off water in the tree watering process through mobile applications. This project was developed by using the Agile Model as a methodology. Overall the development of IoT is beneficial in human life nowadays. As well as farmers running the country's agricultural industry, with a smart tree watering system, the watering process can be implemented in a timely and effective manner without wasting resources.

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Introduction

The advancement of information technology has had a global impact on societies, including Malaysia (Mariam, 2007). Malaysian society must evolve from a developing and industrial society to a post-industrial one. Skills development and information literacy are essential for Malaysia to become a developed country. In today's technologically advanced society, all human activities rely on information technology to assist daily tasks. The Global Sensing enabled by Wireless Sensor Network (WSN) cut crosswise over numerous zones of current living (Sheth, 2019).

Among the activities that benefit from the advancement of information technology are gardening at home and in nurseries. Maintaining a garden is a laborious and time-consuming activity in and of itself; on top of that, watering plants efficiently has become a need for sustaining energy usage and conserving water. Garden digitization is necessary in order to feel a richer sense of aesthetics and a breath of fresh air without having to be a propagator. The technology that enables us to flourish within our walls may also contribute to the

nourishment of our small patch of nature. This idea proposes a smart gardening system that makes use of the Internet of Things (IoT) concept.

Irrigation is the main problem in agriculture in countries in the developing stage. The leading cause is low rainfall; due to this, more land is not irrigated. Another significant reason is the unplanned usage of water resources. In this way, more water gets wasted. The drip system only supplies water to the plant zone, thus saving a large amount of water (Mithya V, 2019). Smart Home Gardening System can provide water to plants whenever they need water at regular power supply intervals. One of the things that can help the Internet of things (IoT) with daily activities is the agriculture section. The flawless integration with wireless sensors and IoT in smart agriculture can currently raise agriculture to a previously unthinkable. (Chalimov, 2020) Agriculture activities will manage effectively by using a smart monitoring system via IoT platforms.

However, gardening is not a quick fix hobby. Gardening involves some expertise, knowledge, and devotion on the part of the individual. For instance, some plants require daily watering, which presents a challenge for those pressed for time, particularly those living in metropolitan settings (Abidin, 2015). Based on that reason Smart Home Gardening System is developed to overcome the problem in managing gardening issues and monitor their farms effectively.

Method

Needs Analysis Phases

In the needs analysis phase involves the process of identification and evaluation of requirements. The first step should be to successfully develop an effective developing system (Bleich, 2018). In this phase, the user needs analysis is used to build suitable prototypes according to the needs of farmers in managing the watering process.

Design Phase

The design phase clarifies the overall view of the appearance, structure, and types of media and technology involved (Baharuddin Aris, 2006). In this phase, three designs need to be developed: block design, integration process design, and interface design. Block design requires several steps, such as circuit design and block diagrams to determine how the sensors are connected to the controller, and water pump to perform automatically watering. The integration process design allows all components to be integrated to produce a system controlled automatically to meet user needs. This interface design was developed using Blynk software to create an interface to allow users to control the system using buttons provided according to user needs.

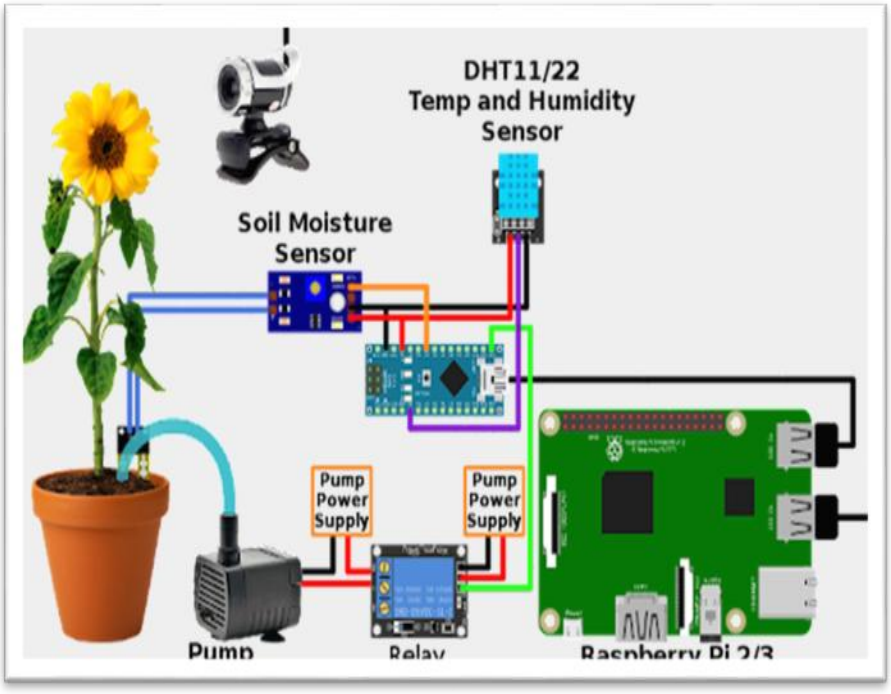

Figure 1 <Block Diagram>

Figure 2 <Automatic Control using Mobile Applications>

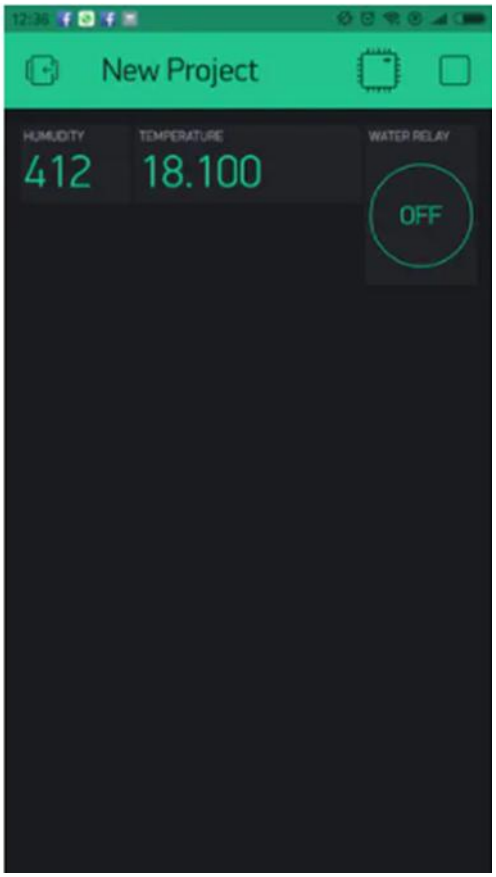

Figure 4 <Smart Home Gardening Interface (Blynk Software)>

Development and Implementation Phase

In the development of this system, the Agile Model has been used to drive the system's growth. In IT projects, the success rate is more remarkable in the Agile Model than in Waterfall. More importantly, the failure percentage is lower in Agile, and as the IT project can be very costly, the risk of failure can have a massive impact on the company that tries to create such a project (Vlad HURTOI, 2020). The Agile SDLC model combines repetitive and additional process models with a focus on customization process and customer

satisfaction with fast-functioning software product delivery. The AGILE Model involves several phases, namely Planning, Requirements Analysis, Design, Coding, Deployment and Maintenance.

In the social and behavioral sciences, it is important to always provide sufficient information to allow other researchers to adopt or replicate your methodology. This information is particularly important when a new method has been developed or an innovative use of an existing method is utilized. Last, please avoid to make a sub section in Method.

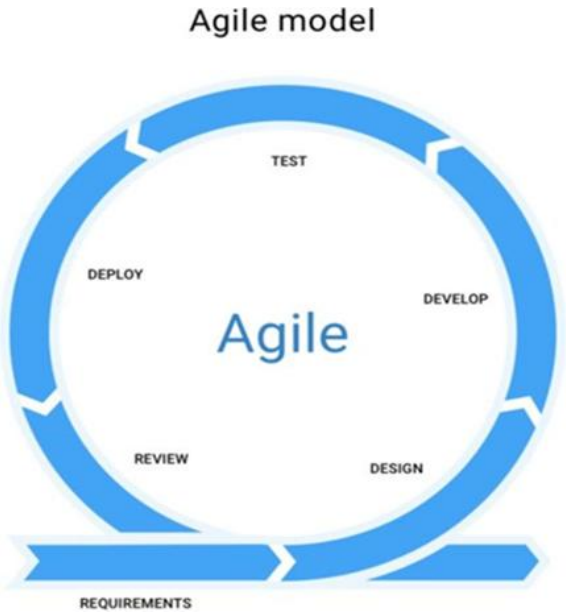

Figure 5 <Model Agile>

Testing Phase

In this phase, this system is tested in several nurseries around Terengganu, one of the nurseries that tested this system is the NURIN NURSERY Besut area, Terengganu. This system is used to control the process of watering the trees automatically.

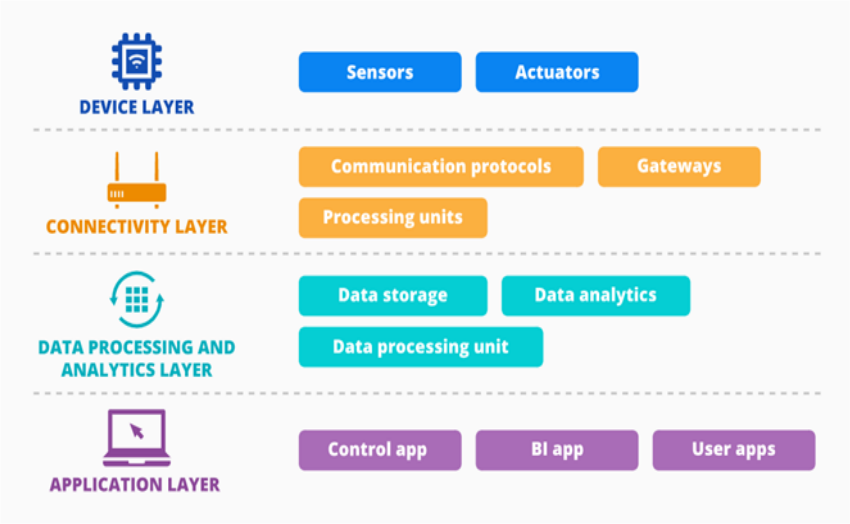

Figure 6 <Testing Component Phase>

Evaluation and Repetition Phase

In this phase, the user will make an evaluation of each page in the system. If there is feedback from users, corrections and improvements will be implemented to meet the needs of users. In this phase, there is repetition to each phase in the AGILE Model to ensure that the system meets the user's requirements.

Results and Discussions

In this phase, several user interfaces are created to make it easier for users to control the system automatically. Interfaces for setting parameters to enable the system to function effectively are also created. Refer to Figure# 7; the interface shows the primary interface for the developed application. This interface will display the PH value for soil moisture and general setting. Users can also turn off the water function manually if necessary to refer to Figure# 8.

Figure 7:< Main Pages >

Figure 8 < Water Flow Setting Interface>

Refer to figure#9. This interface will display the PH value for soil moisture on the crop. If the soil moisture is reduced, water will automatically be pumped into the soil until it reaches the moisture pH according to the rate set to suit the crop. Users are given the option not to use this application to perform watering manually. The system provides a menu to close the application regarding Figure#10. On and off menus are provided to make the work process more flexible

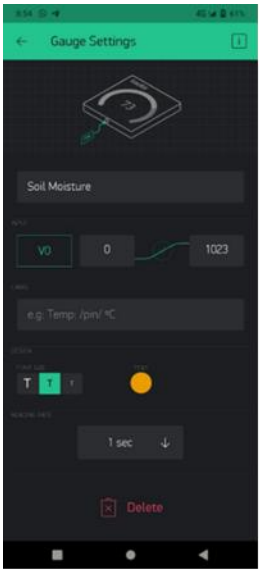

Figure 9 < Soil Moisture Detection Interface>

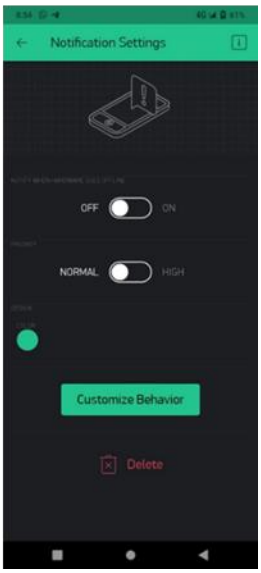

Figure 10 <ON/OFF Interface>

Conclusions

The Automation the process of monitoring the garden can transform garden irrigation process from being manual and static to smart and dynamic one. This leads to higher comfortability, water using efficiency and less human supervision effort (Omary, Sabbagh& Al-Rizzo(2018). Internet of Things applications may be

employed in a range of contexts, both critical and non-critical. Although an issue may appear small at times, the requirement for an optimal solution is believed to avert long-term problems. There are several instances of how basic IoT applications may be used to solve problems in our home environment. Among the most often used approaches are short-range RFID and Wi-Fi medium-range solutions (2021, Norfaradilla). In general, the growth of IoT is helpful to modern human existence. Along with farmers who operate the agricultural business in the nation, the presence of a smart tree watering system enables the watering process to be carried out efficiently and effectively without wasting resources.

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