Internet of Things Smart Gardening in SMK Muhammadiyah 1 Ngoro Jombang

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ABSTRACT

In the increasingly sophisticated and developing technological developments, many people use technology as a tool that can help or facilitate work ranging from studying, completing homework, to gardening by utilizing technology. In the plantation sector, currently most people still use manual methods, one of which is in the process of watering plants. IoT Smart Gardening is one of the applications of Internet of Things (IoT) technology in agriculture. Research methodology is a collection of work steps to facilitate research. Several methodologies are used in compiling this research. Observations are made to check each observation by monitoring the use of the IoT Smart Gardening system and observing the interaction of farmers with the system. The prototype of the automatic plant watering tool or smart gardening that has been designed will be placed near the plants with a maximum distance of 1 meter. Because to facilitate the work of the sensor, the prototype of the automatic plant watering tool will be placed near the plants or garden so that the sensor works optimally. The results of the research activities that have been carried out by the author on the smart gardening system based on the Internet of Things (IOT) at SMK Muhammadiyah 1 Ngoro can run well in terms of functionality.

1. INTRODUCTION

In the development of increasingly sophisticated and developing technology, many are taking advantage of technology as a tool that can help or facilitate work ranging from studying, completing homework to gardening using technology. In the plantation sector, currently most people still use manual methods, one of which is the process of watering the plants (Darmawan, 2021)

IoT Smart Gardening is one of the applications of Internet of Things (IoT) technology in agriculture. With IoT Smart Gardening, farmers can create garden systems that are more efficient, convenient and automatic. In this smart garden, farmers can monitor and control various aspects of their garden, such as soil moisture level, temperature and light, using connected devices such as sensors, controllers and actuators.

Through the use of IoT technology, farmers can increase the efficiency of crop production and reduce the use of unnecessary resources, such as water and energy. In addition, IoT Smart Gardening can also assist farmers in overcoming challenges faced in farming, such as climate change, plant diseases, and resource shortages.

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With the connected IoT Smart Gardening system, farmers can monitor and control their gardens in real-time, even remotely via smartphone or web devices. This allows farmers to make the right decisions and take the necessary actions quickly, thereby increasing productivity and efficiency in farming.

So if you can communicate with the plant, the plant owner can find out the condition of the plant. So that the owner can find out the right time to be able to water the plants, and find out the less suitable time to water the plants, provide nutrition and provide other needs. Especially in terms of watering plants, lighting, checking temperature and humidity in plants.

Based on the description above about the importance of regulating proper soil moisture, appropriate water content, it is necessary to design a tool that can monitor and control soil moisture in a plant. One of these technologies is to help in the community environment.

2. METHODS

Research methodology is a collection of work steps to make research easier. Several methodologies were used in compiling this research. Observations were made to check each observation by monitoring the use of the IoT Smart Gardening system and observing the interactions of farmers with the system.

The framework in this study describes the process of work steps carried out by researchers in conducting this research so that each work step can be well structured to get the expected data results later. The following is an overview of the research framework, including:

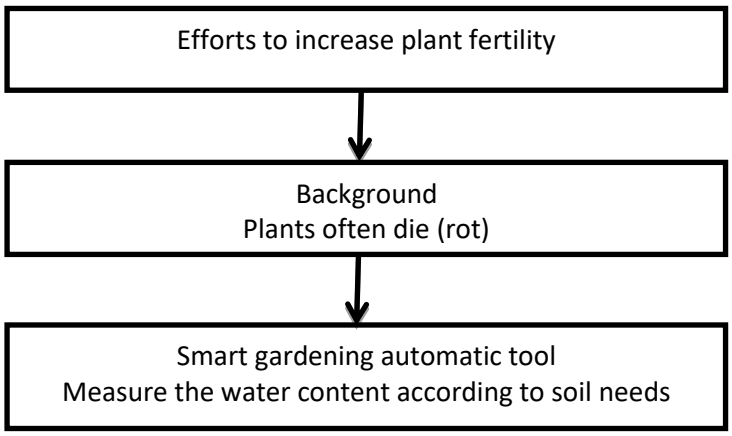

Figure 1. Research Framework

The hardware design method for the development of the IOT Smart Gardening tool system is carried out by requiring several specifications in the following method:

a. Analysis

The analysis was carried out to analyze data and information as a reference for making Smart Gardening automatic plant watering devices (IOT).

b. Design System

System design is used to find an overview which is adapted to the conditions that exist in that location. So that in the manufacture of automatic plant watering devices (IOT) Smart Gardening is appropriate and can be applied properly by farmers.

c. Device implementation

Implementation is used to realize the design to be built, this uses several necessary devices such as:

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a) Software

In this study, using some software as follows:

- The operating system used is Microsoft Windows 10
- The code editor used is Arduino
- The Blynk app

b) Hardware

In this study, using the following hardware:

- HP brand laptops
- Capacitive Soil Moisture Sensor
- Relays
- Arduino Nodemcu
- i2c lcd
- pump
- Solder
- Component cable
- Panel Box
- Plant Media
- Screwdriver
- Bolt

3. RESULTS AND ANALYSIS

The results will be displayed in the form of tables and pictures of the tools that have been designed. To test the automatic bell system, the tool that has been designed is placed on a wall or table where the tool is loaded in a box to avoid sunlight and rainwater which can later cause the device to short circuit or be damaged. Apanila Tool installed near the park which is approximately 1 meter away. The following is the result of a prototype tool for automatic plant watering or smart gardening that has been designed (Khairunnisak, 2022).

The prototype tool for automatic plant watering or smart gardening that has been designed will be placed near the plants with a maximum distance of 1 meter. Because to make it easier for the sensor to work, the automatic plant watering ptototype tool will be placed or placed near a plant or garden so that the sensor works optimally (Suryana, 2021).

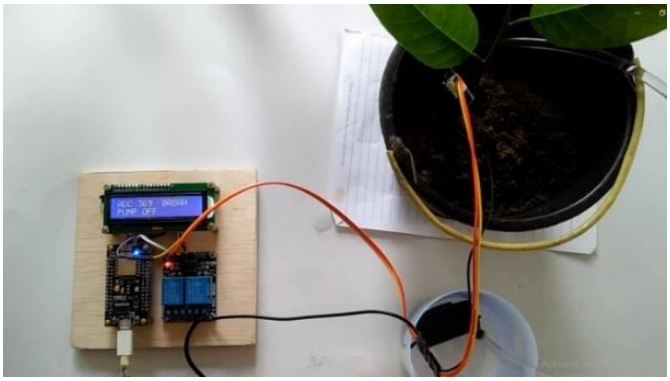

Figure 2. Soil Moisture Sensor Tool

To test the series of tools, you can see the Blynk notification. So to make sure the WiFi is in a good network state so that the device continues to work. The test results will be seen based on the distance from the location where the tool is placed. The following will describe the results of the sensor work test in tabular form based on the results of the soil moisture sensor.

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Figure 3. Display of the Blynk Application

IOT Smart Gardening testing using Soil Moisture sensor Testing of soil moisture or soil moisture sensors is carried out using dry soil and wet soil samples, where the soil moisture sensor has an analogue value from 0 to 100 and a value of 100 for very wet and 0 for very dry . The soil moisture sensor is calibrated according to field requirements. In field conditions, the value of damp or wet is set at a percentage value of 100% and the dry value is set at a percentage value of 0%.

Table 1. Table of Soil Moisture Content

No	Kelembaban Tanah (%)	Kondisi	Pompa Air
1	0 – 50	Kering	Menyiram
2	50 – 100	Basah	Tidak Menyiram

Automatic Watering Test This test is to prove the accuracy of the humidity percentage that is set through the application with automatic watering carried out by this device. The DC water pump will turn on if the percentage of soil moisture is less than the minimum percentage value for the application and will stop if the percentage of soil moisture is more than the maximum percentage value for the application.

The following is the overall testing process. The test is carried out periodically from January 15 to January 17, 2023. Test data is taken at 2 times, namely morning and afternoon. Overall Automatic Watering Test Results

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Table 2. Automatic Watering Test Results

Date and time	Time	Soil Moisture	DC pump	Soil Moisture After Watering
January 15th	09.15	80	Dead	80
	14.05	52	Life	85
	15.10	65	Dead	65
January 16th	10.18	65	Dead	65
	13.12	57	Life	87
	15.00	66	Dead	65
January 17th	08.12	82	Dead	65
	12.03	61	Life	84
	16.00	66	Dead	65

4. CONCLUSION

From the results of the activities and discussions that have been carried out by the author about the Internet of Things (IOT)-based Smart Gardening system at Muhammadiyah 1 Ngoro Vocational School to the testing process using the NodeMCU ESP8266 microcontroller, it can be concluded that, with the Smart Gardening system, gardeners or schools are not worried if they leave their plants for a long time because the occupants of the house can find out the situation of the plants in real time

5. ACKNOWLEDGEMENTS

This IOT Smart Gardening device design paper is part of the device that was made in an apprenticeship procession. Thank you to those who participated in supporting morally and materially which cannot be called one unit so that this device can be completed properly.

6. DECLARATION OF COMPETING INTEREST

We declare that we have no conflict of interest.

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