

DESIGN AND CONSTRUCTION OF AUTOMATIC PLANTING DEVICE USING NODEMCU BASED ON INTERNET OF THINGS

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ARTICLE INFO		ABSTRACT
Received:	07-01-2022	Advances in science and technology have provided enormous benefits in helping human work, including in watering plants. Given the importance of the benefits of technological developments based on real life, that automatic watering using sensors has replaced traditional methods with human power in carrying out daily activities and in the industrial sector. In this study, hardware and software for an automatic watering control system will be built. The research method uses a literature study approach in the form of books and research reports related to the system to be designed. The automatic watering device is built based on the NodeMCU ESP8266 microcontroller and is equipped with a soil moisture sensor. Based on the experimental results, the automatic sprinkler as a means of facilitating plant care using a soil moisture sensor works well according to the program entered, where when the humidity value is above 85 the device will water automatically and if the humidity value is below 85 the device will stop watering.
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INTRODUCTION

Along with the rapid development of information technology, it has had an impact on globalization, especially on business competition, job demands, and lifestyle demands are increasing. In order to compensate, humans create tools that can work automatically and have high accuracy and can even exceed human accuracy, so that their work becomes easier. Currently, watering plants traditionally is considered less efficient because of the length of time in watering plants. Not only that, watering plants traditionally requires a lot of energy in watering plants. This causes the owner to be unable to leave the plant for a long time and causes the plant to wither or die from lack of water.

Plants are living things that need water for their development. Fertile soil is a prerequisite for plants to grow well. Fertility levels can be influenced by the intensity of the water it contains (Kafiar, Allo, & Mamahit, 2018). In order for plants to grow well, they need good soil moisture conditions. Soil moisture is water that fills part or all of the soil pores above the water table. Another definition states that soil moisture states the amount of water stored between soil pores is very dynamic, this is caused by evaporation through the soil surface and percolation (Lutfiyana, Hudallah, & Suryanto, 2017). Soil moisture is water that partially fills or soil pores above the water table. Soil moisture is very dynamic, this is caused by evaporation through the soil surface, transpiration and

percolation. Soil moisture information can be used for water resource management, early warning of drought, irrigation scheduling, and weather forecasting ([Pratama, 2019](#)).

To maintain and detect the soil moisture is required humidity sensor (moisturesensor). Soil moisture sensor (sensor soil moisture) is a sensor capable of detecting the intensity of water in the soil. This sensor consists of two probes to pass current through the soil, then reads its resistance to get the moisture level value. More water makes it easier for the soil to conduct electricity (small resistance), while dry soil is very difficult to conduct electricity (large resistance) ([Pratama, 2019](#)).

Making a device that can monitor water levels using the HC-SR04 ultrasonic sensor and also automatic plant sprinklers using a microcontroller Arduino Uno is based on existing soil moisture, so it can run with the given conditions and other electronic devices can operate as desired. The results of this study are tools that are made to make it easier to water plants through a water pump automatically when the water level is above 6cm and below the value of 4cm and soil moisture is above the value of 450 and below the value of 400 ([Haris, 2017](#)).

To support this, the authors are interested in making automatic plant sprinklers. Where in this tool the author uses a sensor soil moisture and NodeMCU as the main control and control in the tool.

METHODS

The research method uses a system development model, the waterfall model. The stages of the waterfall model software development method according to ([Sukamto & Salahudin, 2014](#)). is:

a. Software Requirements Analysis

The process of gathering requirements is carried out intensively and specifically on software requirements so that users can understand what kind of software is needed by the user. Software requirements specifications at this stage need to be documented.

b. Design

Software design is a multi-step process that focuses on the design of a software program including data structures, software architecture, interface representations, and coding procedures. This stage translates software requirements from the requirements analysis stage to the design representation so that it can be implemented into a program at a later stage. The software design produced at this stage also needs to be documented.

c. Program Code Generation

The design must be translated into a software program. The result of this stage is a computer program in accordance with the design that has been made at the design stage.

d. Testing

Testing focuses on the software logically and functionally and ensures that all parts have been tested. This is done to minimize errors and ensure that the output produced is as desired.

e. Support or Maintenance

It is possible for a software to experience changes when it has been sent to the user. Changes can occur due to errors that appear and go undetected during testing or the software must adapt to a new environment. The support or maintenance phase can repeat the development process from the specification analysis phase to new software changes

RESULTS AND DISCUSSION

Tool Design Results

The results of the design of the automatic plant watering device can be seen in Figure 1. While the information for each part of the hardware circuit will be explained in table 1.

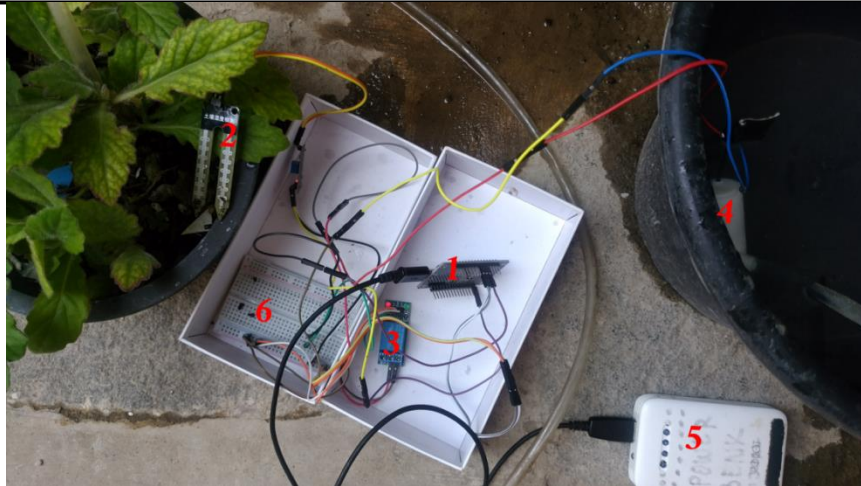


Figure 1
Tool Design Results

Table 1
Description of the Toolkit

No	Description
1	<i>NodeMCU ESP8266</i>
2	Soil Moisture Sensor
3	<i>Relay</i>
4	Mini Water Pump
5	Powerbank
6	Breadboard

Testing of automatic plant watering tools using NodeMCU with programming is Arduino IDE done to determine the performance of each component and overall. The results of testing the tool and taking the data are expected to be able to get data valid and the tool works according to its function and purpose.

The test of this tool aims to determine whether the tool that has been made can save time and human effort in watering plants. Testing to shorten energy, with this tool it is certain that watering plants can save energy, because this tool can water plants automatically without the help of human labor. The test to shorten this time is done by comparing the time between manual watering and automatic watering using a tool that has been built. With the testing of the tool, it will be known whether the purpose and function of the automatic watering device that has been designed can be useful and function normally as expected or not. The following is a test of automatic plant watering equipment using NodeMCU which can be seen in table 2.

Table 2
Testing of Watering Time

NO.	Watering manually (second)	Watering using tools (second)
1	5.25	5.34
2	5.46	5.52
3	5.16	6.31
4	5.57	5.49
5	7.13	5.55
6	6.21	6.37
7	6.42	6.04

Judging from the data listed in table 2, the average result of the manual watering time is 18.40 seconds and the average result of watering using an automatic tool is 18.22.

Coding Results

The results of this coding can be said as the implementation of the application that has been made, a discussion of this implementation can be seen in Figure 2.

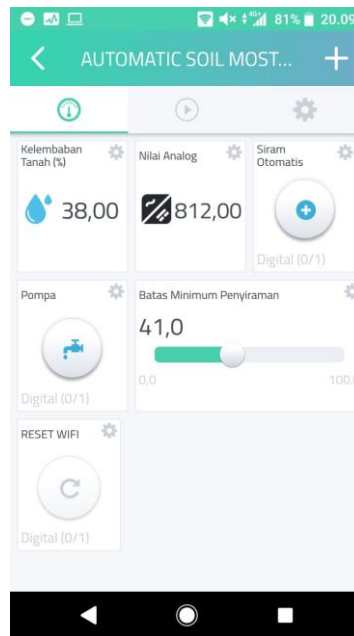


Figure 2
The Main View of the Application

CONCLUSION

This automatic plant sprinkler using the IoT-based NodeMCU is made to save time and effort in watering plants. Based on the test results, this automatic sprinkler can shorten the time in watering plants. This tool is also equipped with a soil moisture sensor. The soil moisture sensor works well according to the program entered, where when the humidity value is above 85 the tool will flush automatically and if the humidity value is below 85 the tool will stop watering. The soil moisture sensor value can also be monitored on Android that has been created.

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