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Plant Watering System Based on the Internet of Thing

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Abstrak. Salah satu aspek dalam sebuah kegiatan pertanian adalah sistem penyiraman tanaman. Akan tetapi sistem penyiraman yang telah ada saat ini masih menggunakan prinsip berjalan secara stand alone. Dari proses kerja sistem penyiraman secara standalone saat ini masih menyisakan permasalahan yaitu setiap penyiraman tidak terdapat informasi yang diberikan kepada petani. Informasi penyiraman sangat penting untuk mengetahui apakan sistem tersebut telah bekerja dengan baik atau tidak. Maka oleh sebab itu diperlukan sebuah sistem penyiraman otomatis yang dapat memberikan informasi penyiraman secara jarak jauh melalui internet dengan menggunakan konsep Internet of Things (IoTs). Tujuan artikel ini adalah membahas perancangan prototipe sebuah sistem penyiraman otomatis berbasis internet of things (IoTs). Prototipe dibangun menggunakan mikrokontroler Arduino Uno, Sensor Kelembaban tanah, pompa air dan ethernet shield. Dari perancangan ini menghasilkan sistem informasi penyiraman air secara real time yang dapat mengirimkan informasi penyiraman air jarak jauh berbasis web.

Kata Kunci: Penyiraman tanaman, Mikrokontroler Arduino, Ethernet, Aplikasi Web

Abstract. *One aspect in an agricultural activity is the plant watering system. However, the existing watering system is still using the principle of running in stand alone. From the working process of watering system standalone at this time still leaves the problem that every watering no information given to farmers. Watering information is very important to know whether the system has worked properly or not. Therefore, an automatic watering system is required that can provide watering information remotely through the internet using the concept of the Internet of Things (IoTs). The purpose of this article is to discuss the design of a prototype of an internet-based automatic watering system of things (IoTs). The prototype was built using Arduino Uno microcontroller, soil moisture sensor, water pump and ethernet shield. From this design resulted plant watering information system in real time that can send web-based watering information.*

Keywords: Watering Plant, Arduino Microcontroller, Ethernet, Web Application

1. Introduction

Information technology today has a positive impact on society at large. Information technology that is synonymous with the progress of computers has brought other technologies towards controlled machines such as microcontroller technology that makes embedded systems technology can provide convenience for users in various fields. One of the embedded applications of developing systems is agriculture. It is known that agricultural technology has now penetrated into the direction of automation of agricultural machinery. With the automation of farm machinery, a farmer can gain more benefits than traditional farming and plantation management.

One aspect in an agricultural activity is the plant watering system. The plant watering system was originally an important and major factor in the planting process. Tampa there is a good watering management then the plant will produce a product that is not maximal or bad. Currently watering systems have been developed in the form of microcontroller-based applications so that management of water management in plants will be more optimal as during the dry season then the system of watering plants will be monitored moisture in a muscle so that if there is water shortage then the application of watering system will provide enough water for plants.

However, the existing watering system is still using the principle of running in stand alone. From the working process of watering system standalone at this time still leaves the problem that every watering no information given to farmers. Watering information is very important to know whether the system has worked properly or not. So therefore with the development of internet technology today it is necessary an automatic watering system that can provide information watering remotely through the internet by using the concept of the Internet of Things (IoTs). Based on the above background then this article will discuss about the design of automatic plant watering system with the web-based remote watering

information with the concept of Internet of Things (IoTs).

2. Literature Review

The development of microcontroller applications today has contributed a lot to embedded systems such as electronics products for the benefit of smarthome, smart office and some other electronics products. Some of the results of research that uses microcontroller in the category of smarthome among others is the design of control systems of household electrical devices wirelessly [1], next is the use of microcontroller in home security application by using Arduino microcontrole and Passive Infra Red sensor [2] and RFID Based Automatic door security system [3].

Currently the development of embedded systems applications has improved its ability in terms of Internet-based communication known as the Internet of Things (IoTs). The embedded system application is integrated in computer network so that it can provide information to the user remotely or known by internet based application model of things (IoTs). The concept of internet of things (IoTs) is the concept by which machines can transmit information between machines with machines via internet communication [4]. With these concepts then embedded system based applications can be easily accessed or controlled remotely via the internet both desktop and smartphone based computer.

Some research that developed embedded systems towards the Internet of Things is a flood early warning system that uses the concept of internet of things (IoTs)[5], a Google Maps based fire monitoring information system [6], a fire detector system that uses GSM as an early warning system communication [7].

The development of embedded system based information system integrated with the internet of things system is very helpful in terms of data storage in database [8] and display data in web or mobile form [9].

Microcotroller used in this research is Atmega328 with minimum system in the form of circuit board called Arduino Uno. Arduino Uno has 14 digital input pins and 6 analog input pins with a power jack and a USB cable connected to the personal computer as a program downloader [4].

3. Research Methods

3.1 System Analysis

In general, the system analysis built is a system built using automatic watering techniques built using soil moisture sensor technology, microcontroller as a processor and ethernet as an intermediary device microcontroller and computer network. This research is expected to help the farmers in monitoring the planting system remotely through the internet browser. as shown in Figure 1 it is seen that the plant watering system will provide soil moisture data and be processed in an internet-based plant watering system of things. From the system will be sent data soil moisture along with the information there is watering plants or no watering through the Internet network in the form of web display.

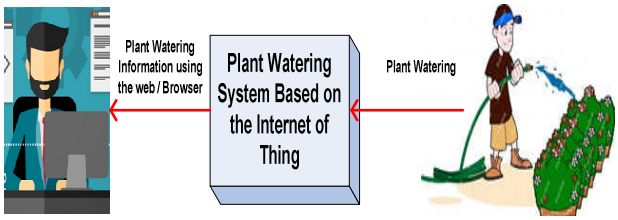

Figure 1. System Analysis

3.2 System Design

The design of the system to be built consists of Arduino Uno microcontroller module, soil moisture sensor, Ethernet Shield, Relay and water pump. Beginning with humidity sensor as input mengimkan data to the microcontroller through analog data pin. Moisture data is processed so that the decision is made watering plants or not. The result of the watering decision will provide the input data to the relay through the digital port so as to execute the water pump for the process of watering the plants. The whole system circuit block can be seen in Figure 2.

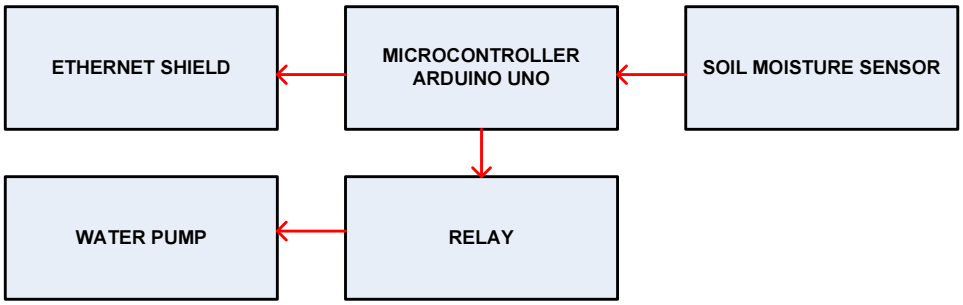

Figure 2. Block System

The design of the use of the internet-based water-flooding system of things can be seen in Figure 3, where it can be explained that the system begins with a soil moisture sensor detecting acetic moisture in the plant and forwarded to the plant watering system. The decision output is sent to the water pump and the information is sent to the internet via the internet to the user.

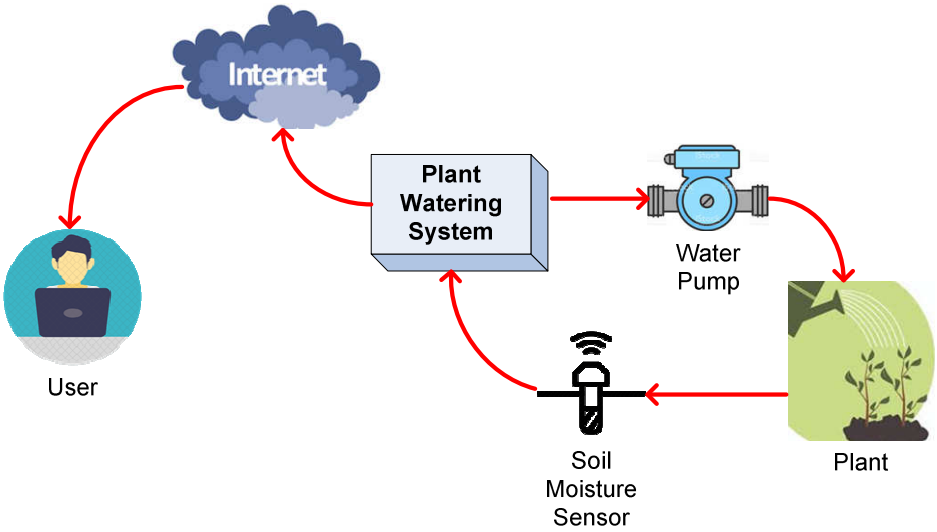

Figure 3. Design of system usage

While water sprinkling decision is done by using flowchart contained in Figure 4. Flowchart begins with start, initialization of input variable ouput for sensor, relay and ethernet shield, next detection sensor of soil moisture data, if sensor data in state in water hence no watering plant , as well as if the sensor is in a humid state then there is no watering plants, in contrast to if the sensor data in a dry state then the plant watering. After the execution of watering with a water pump then the sensor data information along with information sent to the user via ethernet.

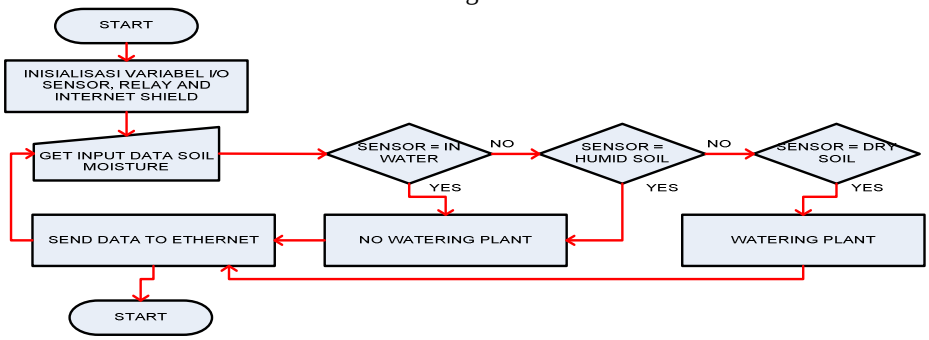

Figure 4. System flowchart design

4. Research Results

The result of the circuit as a whole and which has been adjusted to the design in Figure 2 and the design of the flowchart in Figure 4, the prototype that has been generated in Figure 5 is the prototype of internet-based plant watering system that consists of Soil Humidity Sensor circuit, microcontroller, ethernet shield, wireless routers and watering containers comprising mini water pumps and their watering containers as shown in Figure 6.

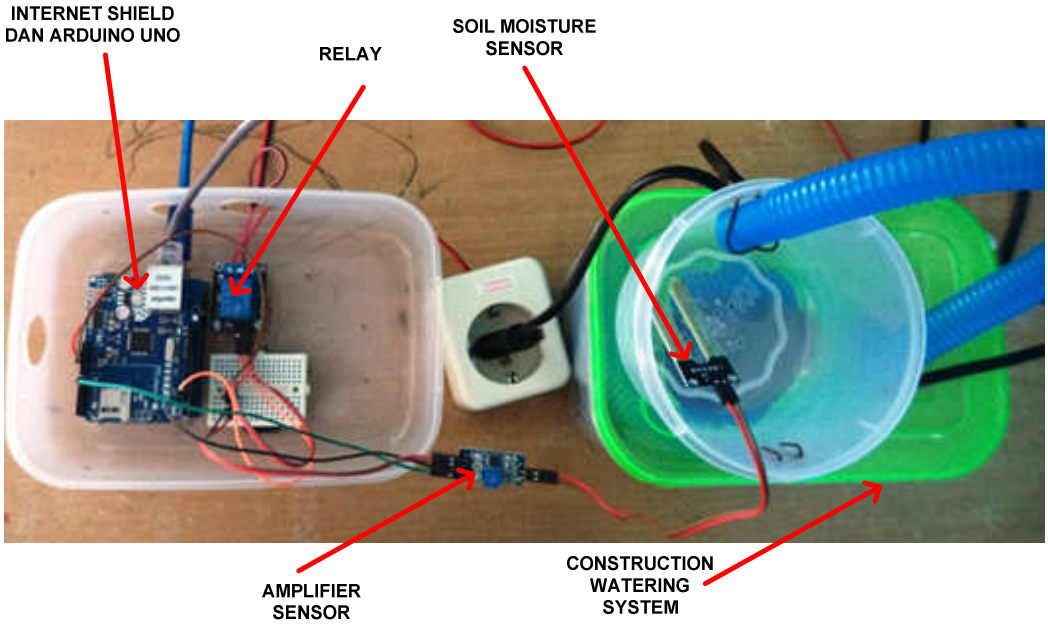

Figure 5. Prototype system

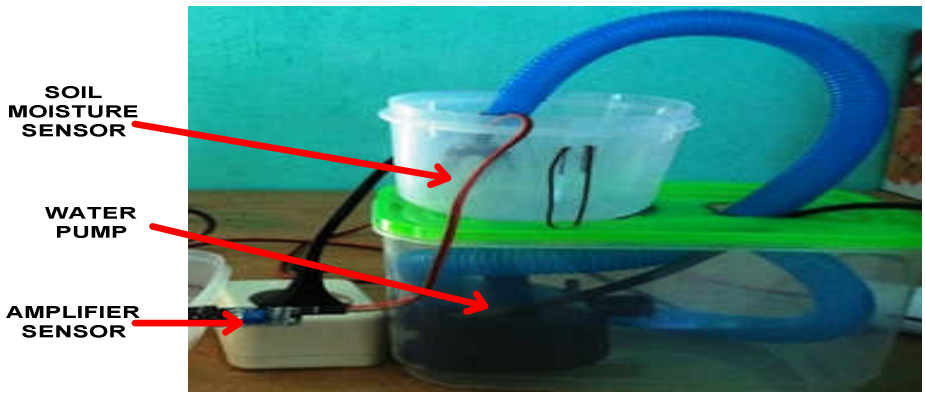

Figure 6. Construction Prototype plant watering system

While the results of web-based monitoring can be seen in Figure 7 is the information that shows information that the state of dry and moderate soil there is watering.

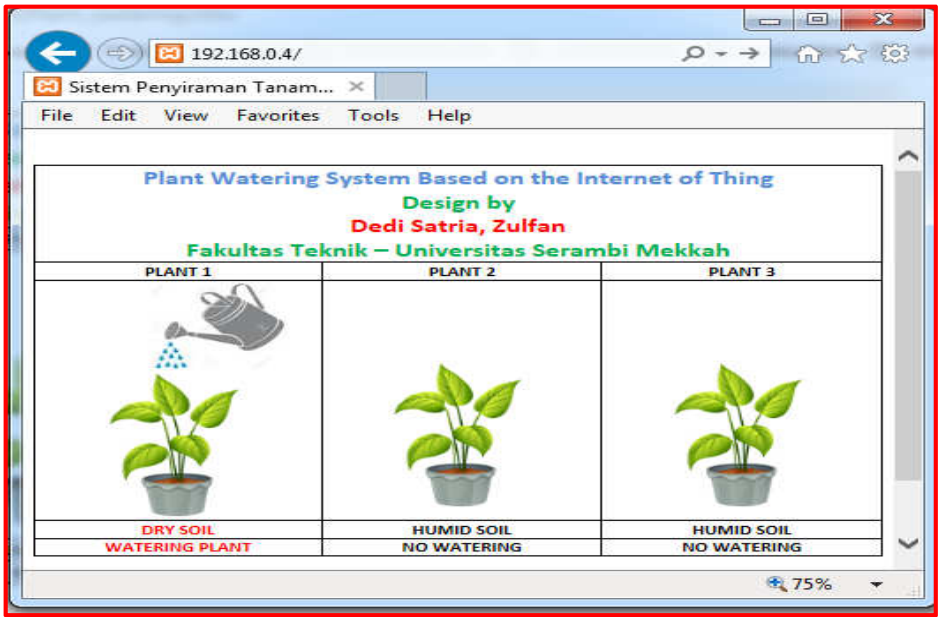

Figure 7. Information of dry and medium state of dry soil

5. Conclusions

Based on the design and the results of the research it can be concluded that the internet-based plant watering system of things has been successfully built and has been executed in accordance with the circuit design and flowchart. In addition, the application has been successfully accessed through ethernet web server in the form of web-based applications so as to facilitate for the user in monitoring the watering of plants from long distance web-based. From the research that has been done still many shortcomings and needed further research to get more perfect results.

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