Application of IoT in Plant watering system

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Abstract: ***One element of an agricultural operation is the method for watering the plants. The new watering system, though, still follows the concept of operating in stand-alone. From the watering device work cycle separately at this time still leaves the question that no knowledge is provided to farmers every watering. Today, IT has a good influence on culture at large. Computer technology, which is associated with technological advancement, has introduced many innovations to managed computers, such as microcontroller technology, which allows embedded devices technology to provide consumers with functionality in different places. The knowledge regarding watering plants is really necessary to learn whether or not the device functioned properly. Therefore, an automated watering device is required which can provide watering details remotely through the internet utilizing the Internet of Things (IoTs) technology The system was designed using microcontroller (Arduino Uno), a sensor for detecting soil moisture, Ethernet shield and a water pump. This architecture culminated in a plant irrigation information device that can deliver irrigation details on the network in real time.***

Keywords: Arduino Microcontroller, Ethernet, Watering Plant, Web Application, Agriculture, Moisture.

INTRODUCTION

One component of an agricultural operation is the irrigation mechanism for plants. Previously the plant irrigation mechanism was an essential and major element in the planting process. There is a better system for watering the plants called Tampa otherwise the plant should yield an output which is not full or poor. Recently, watering systems were built in the form of applications microcontroller-based so that water storage in plants can be more efficient because during the dry season then watering plants device will be tracked moisture in a muscle such that if there is water scarcity then watering device implementation can provide sufficient water for plants [1].

The new watering system, though, still uses the concept of operating in stand-alone. From the watering device work cycle standalone at this time still leaves the question that no knowledge is provided to farmers every watering. Watering knowledge is really necessary to learn whether or not the system functioned properly. Therefore, with the advancement of internet technologies today an automated watering device is required which can provide knowledge watering remotely through the internet utilizing the "Internet of Things" (IoTs) framework. On the basis of the above context, this paper will then address the architecture of automated plant watering device with web-based remote watering knowledge utilizing the Internet of Things (IoTs) framework.

Water scarcity is one of the world's most important challenges. There are also various approaches implemented for water management. Water is required in every field & for every animal, human being, herb, etc. Agriculture is one such area where large quantities of water are necessary. Water wastage is a big concern in agriculture. Every when the fields are provided an abundance of water. There are many methods necessary for avoiding or minimizing water wastage from agriculture [2].

Terrace irrigation:

The field is divided into several stages in this method and protected by holding walls as the plain fields are used for planting and the hope is that the water flows down each stage watering each column. This contributed to steep ground being used for various crops. This is a method of irrigation which requires very much labour.

Drip irrigation:

The most efficient irrigation system for water is the system of drip irrigation. Throughout this process water is lowered in a slow steady motion at the root stage of a plant. The depletion of water by evaporation and drainage will be minimized to a large degree if the network is successfully implemented.

Sprinkler System:

This method of irrigation is designed for overhead sprinklers mounted at permanent risers. The system is built underground and the sprinklers ramp out as water demand rises, a renowned system of irrigation for use in parks and golf course.

"Automatic irrigation system" is proving really beneficial for passengers. Automatic irrigation systems can be very cost efficient if correctly built and programmed, and can do a lot of water conservation. The method of watering with waste water of oscillator or a pipe and neither of these approaches target at plant roots. Automatic irrigation systems may be built to provide the appropriate amount of water in a given region and to facilitate the recycling of water as well [3].

LITERATURE REVIEW

To the advantage of smart office, smart home, and some other electronics items, the production of microcontroller systems nowadays has contributed a lot to integrated systems like electronics devices. Some of the research findings that use microcontrollers in the smart home group, among others, are the construction of household electrical interface control systems wirelessly, and the usage of microcontrollers in home protection applications by using Passive IR sensor, Arduino microcontroller and Automatic door detection system based on RFID [4].

In terms of Internet-based networking, defined as the "Internet of Things" (IoTs), the development of embedded device software has now enhanced its functionality. The embedded device functionality is implemented in the computer network to provide user knowledge directly or via internet-based functionality "Internet of Things" (IoTs) accessible to them. The idea of the internet of things (IoTs) is the idea through which machines may relay information via Internet contact between machines with machines. Embedded system-based software may then be conveniently accessed or remotely managed from the mobile and smartphone-based device through the internet [5].

Some work that built embedded devices against the Internet of Things is a flood early warning device that uses the "Internet of Things" (IoTs), a fire detection information system focused on Google Maps, a fire alarm system that uses GSM as an early alert system contact framework. The creation of embedded machine-based information system incorporated with the internet of things network is very beneficial when it comes to data collection in database and web or smartphone viewing of data [6].

Atmega328 is the micro-controller used by the researchers in the form of a circuit board named Arduino Uno, with minimal framework. Arduino Uno has 6 analogue input pins and 14 optical input pins and with a power jack and a USB cord attached as a downloader to the personal computer.

For this paper the sensor of soil moisture is mounted in the plant / field root section. The sensor transfers input to the microcontroller and moves the details on. An algorithm was built for calculating the threshold value of the soil moisture sensor, which was programmed into a microcontroller to measure the soil moisture content. This paper develops an automated irrigation device layout that is based on "ATMEGA328 microcontroller". Sensors of temperature and soil moisture are brought into the ground. Sensors sense the soil's moisture content and send farmers the information through GSM Module. Farmer will get to know the status of the pump mounted in the field without heading into the field via GSM module. When the moisture content crosses the required threshold value the pump switches off automatically and the alert is transmitted to the farmer [7].

RESEARCH METHODOLOGY

Generally speaking, the analysis designed is a system developed utilizing automated watering techniques developed utilizing microcontroller as processor, soil moisture sensor technology, and Ethernet as microcontroller and computer network intermediary unit. This work is supposed to help the farmers remotely track the planting program through the internet browser. As seen in Fig 1 it is shown that soil moisture data would be generated by the plant watering system and stored through an Internet-based plant watering system. In the form of a web interface, the data regarding the content of moisture in the soil would be transmitted from the device along with the knowledge there are no watering or watering plants via the network of the internet.

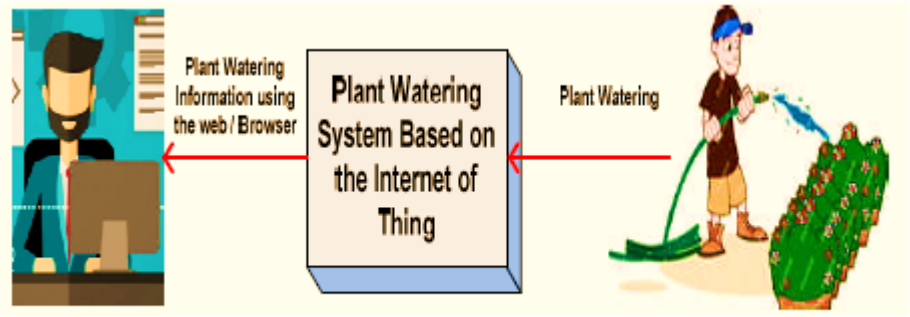

Fig 1: System Analysis

The device architecture to be installed consists of microcontroller module- Arduino Uno, Ethernet Shield, soil moisture sensor, Relay, water pump and relay. Starting with humidity sensor as input mengimkan data to the microcontroller via analogue pin data. Moisture details are stored in such a way that watering plants agree or not. The outcome of the watering decision would include the relay input data via the digital port such that the water pump is performed for the plant watering cycle. Fig 2 displays the whole circuit block for the device [8].

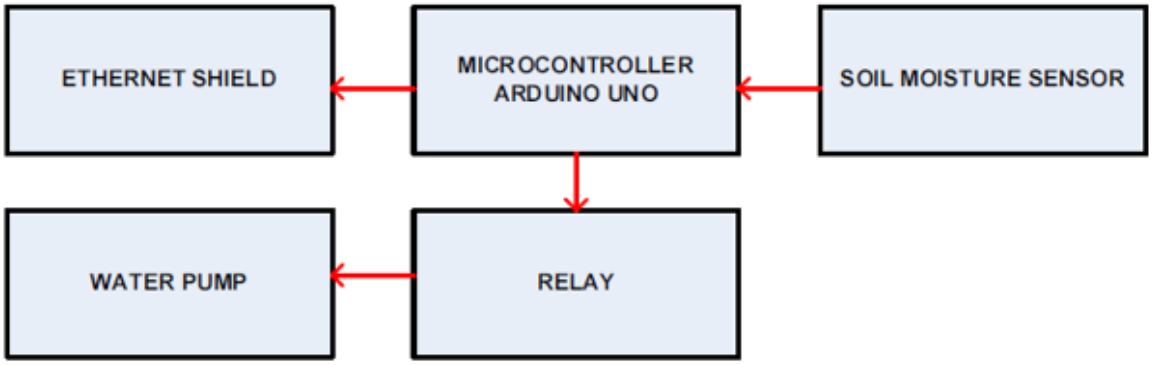

Fig 2: Block System

The nature of the usage of water-flooding frameworks which is based on the "internet of things" is illustrated in Fig 3, where it is demonstrated that the framework begins with a soil-moisture sensor sensing acetic moisture in the field and transferred to the field watering method. The data regarding the output decision is transferred to pump and the information is provided to the user via internet [9].

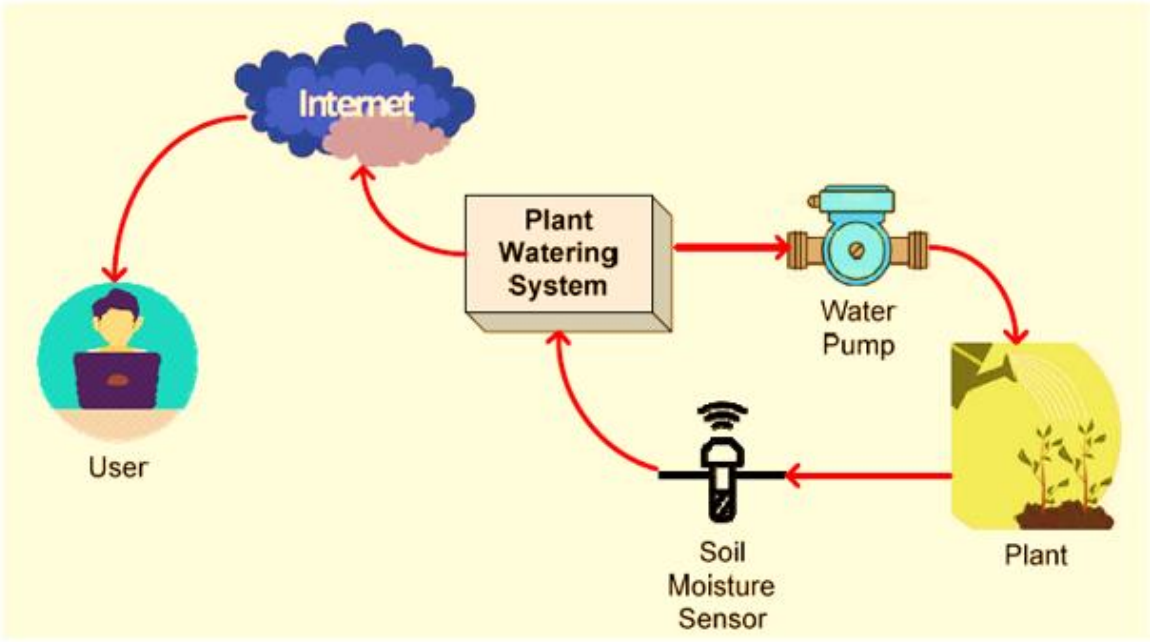

Fig 3: Design of system usage

When the decision to sprinkle water is made using flowchart found in Fig 4. flowchart illustrates the from the initial process, initialization of input variable output for sensor, Ethernet shield, relay and, further

detection of level of moisture content in the soil, if data obtained by the sensor in water state then it is termed as no watering field, as well as if the sensor is in a humid state then there are no watering plants, unlike if the sensor data in a dry state then the field watering plant. When the plants are watered then the details of the sensor transfers the data regarding the watering of plants via Ethernet [10].

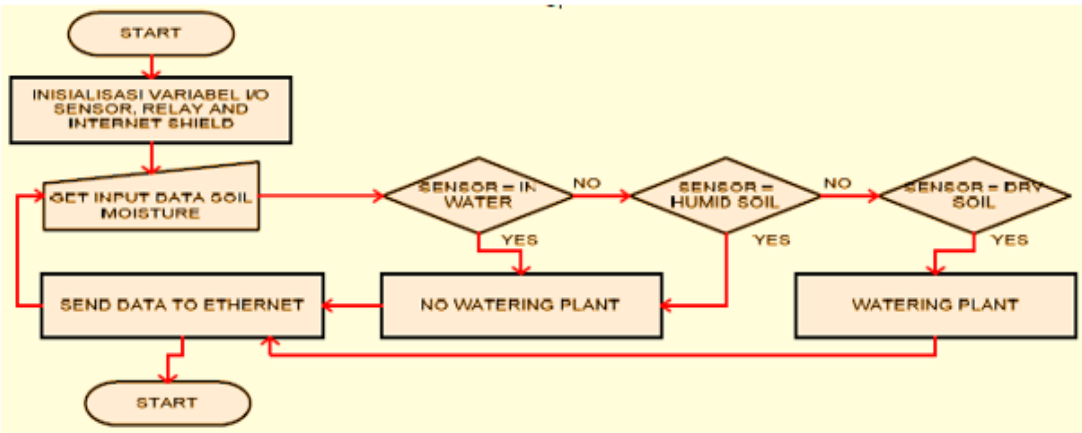

Fig 4: System flowchart design

Figure 5 illustrates the prototype of the components used for the plant watering system which are IOT based. The system comprises of Microcontroller, Soil moisture sensor, Ethernet shield, routers which are wireless and several watering containers comprising of mini water pumps and their watering containers as illustrated in figure 6.

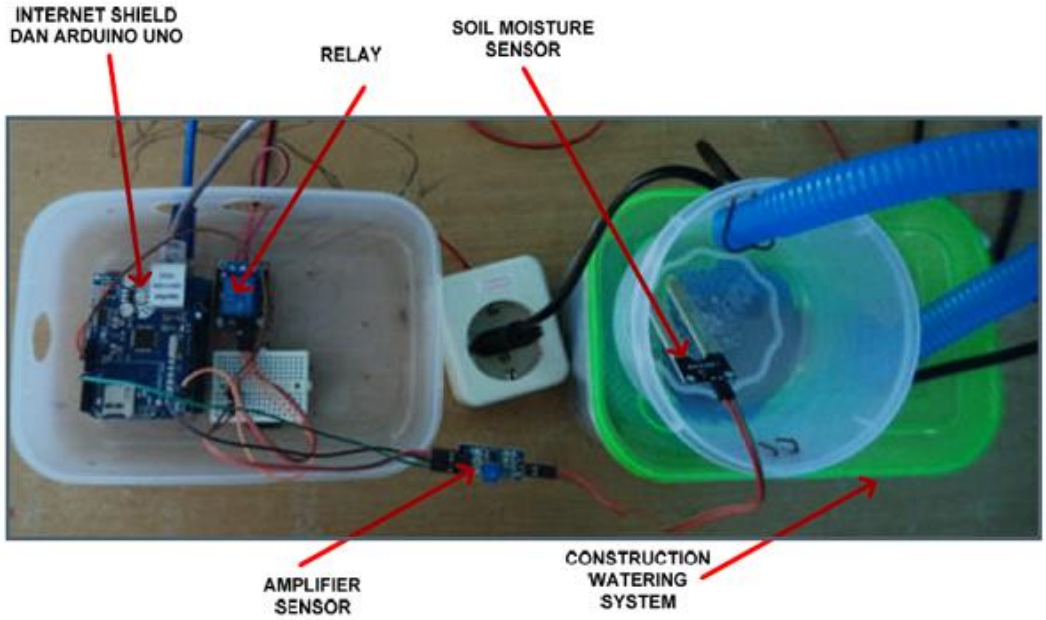

Fig 5: Prototype system

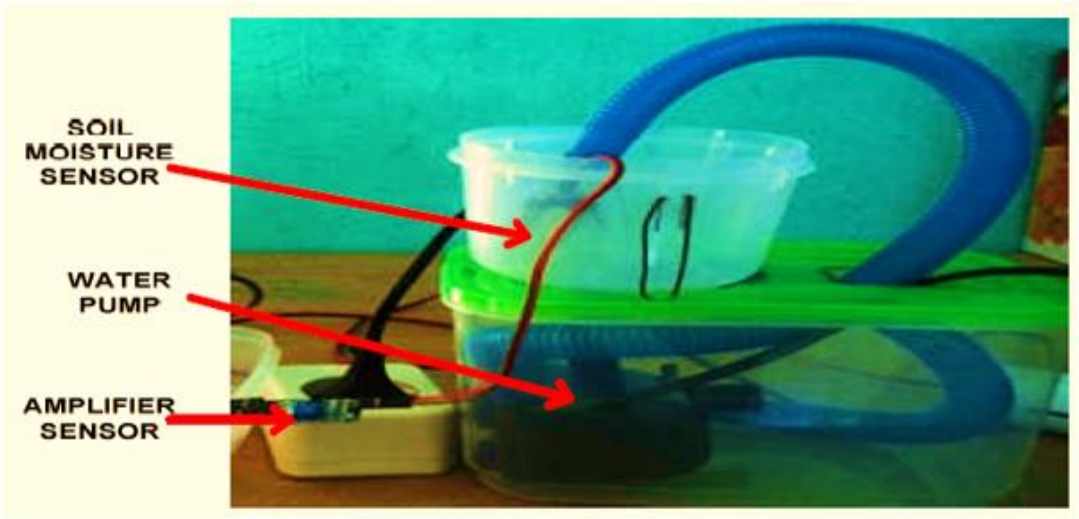

Fig 6: Construction Prototype plant watering system

The results obtained from the web-based monitoring is illustrated in figure 7. This provides the information regarding the state of soil i.e. which may be moderate or dry before watering it.

Fig 7: Information of dry and medium state of dry soil

CONCLUSION

There have been several researchers focusing on automated water sprinkling or irrigation. To assess the soil quality and quantity of water they opted for various metrics. They have demonstrated about various power sources for the sensors. In addition, the scholars also addressed the technologies for building network among the sensors and designing the control device. A report on the automatic water delivery network for urban residential areas suggested that such a program can be used to control water supplies effectively. This paper focuses on an Automatic Water Supply Network implementation. There are many options to pick one. Water is the most essential food source for the plants. They can not live without water, although inadequate water source will contribute to other complications, too.

For example, water that has collected at the roots of a sapling for a long time may destroy the roots and also cause the mineral loss in soil. The quantity of water to be provided to the trees often relies on the quality of soil humidity and sunshine. Any failure in this respect would damage their upbringing. Measuring the correct soil and atmosphere is therefore crucial in deciding the appropriate quantity of water required for plants. It can be inferred, based on the concept and the findings of the testing, that the internet-based plant watering scheme of things was effectively designed and performed in compliance with the circuit design and flowchart. However, the program has been successfully accessed via Ethernet web server in the form of cloud-based applications to make it simpler for the customer to track long distance cloud-based plant watering. There are also several drawbacks from the work that has been completed and those requires more study to achieve more flawless tests.

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