Smart Irrigation Wireless Control System for Agriculture

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Abstract - *The objective of this work is to device an intelligent and autonomous sprinkler system that operates based on the real time moisture content in the soil to be watered. The IoT enabled controller allows the control the sprinkler remotely using android application in the extraordinary situations. The system is built as a low-cost model as compared to the earlier reported sprinkler systems using different wireless modules. The IoT feature in the present system can be an additional advantage as the user from anywhere in the world. The system has a distributed wireless network of soil moisture.*

As the technology is growing and changing rapidly, Wireless sensing Network (WSN) helps to upgrade the technology where automation is playing important role in human life. Automation allows us to control various appliances using the android application in this system. The objectives of this system were to control the water supply to plant automatically depending on values of soil moisture sensors. This is made possible by sending the received data to the android device using Bluetooth technology using Bluetooth module. The entire System is controlled and executed by Arduino board and android application.

***Key Words*: Irrigation system, Water sprinkler system, Wireless sensing network, Soil moisture sensor, Android application.**

1. INTRODUCTION

A sprinkler is a watering device that is used to deliver the necessary water to the soil evenly, amply, easily as it is obvious that it would be impossible for a human being to water large area of field every day and multiple times throughout the day. Sprinklers need a lot of water to function properly but the shortage of raining and land reservoir water has become a major issue. In this paper, the idea is proposed of using moisture/humidity sensors.

Irrigation monitoring and controlling system. The system develop to monitor the environmental conditions such as water flow sensor, soil moisture content and water level of agriculture land for controlling the irrigation. The real time conditions sensed data is send to the Android device for storing and decision making and controlling actions for future also. Sensor for water distribution as per only the requirement. Android is a mobile operating system developed by Google, based on a modified version of the Linux kernel and other open source software and designed primarily for touch screen mobile devices such as smart phones and tablets.

An Irrigation sprinkler (also known as a water sprinkler or simply a sprinkler) is a device used to irrigate agricultural crops, lawns, landscapes, golf courses, and other areas. They are also used for cooling and for the control of airborne dust. Sprinkler irrigation is the method of applying water to a controlled manner in that is similar to rainfall. The water is distributed through a network that may consist of pumps, valves, pipes, and sprinklers. Irrigation sprinklers can be used for residential, industrial, and agricultural usage.

2. RELATED WORK

Plenty of research work has been done to improve the performance of agriculture field.

In paper [1] Wireless sensor network is integrated with ZigBee to transmit soil moisture level and temperature values. The data is transmitted to a web server using GPRS through cellular network. The data monitoring can be achieved via internet using graphical application.

Rajeshwari (2016) [2] The architecture of the proposed system. It consists of four major components- monitoring unit installed in the farm, control unit installed in the pump house, server mobile placed close to the control unit and a remote client mobile. Monitoring unit, which is placed in the field, monitors important agricultural parameters such as soil moisture, soil pH, temperature and humidity, and transfers the data to the server mobile. The server mobile, which is placed in the pump house close to the control unit, processes the sensed information and makes appropriate irrigation decisions.

In this paper [3] The architecture of the proposed system. It consists of four major components- monitoring unit installed in the farm, control unit installed in the pump house, server mobile placed close to the control unit and a remote client mobile. Monitoring unit, which is placed in the field, monitors important agricultural parameters such as soil moisture, soil pH, temperature and humidity, and transfers the data to the server mobile. The server mobile, which is placed in the pump house close to the control unit, processes the sensed information and makes appropriate irrigation decisions.

Microcontroller based automated irrigation system was reported by Shiraz [4] Also, using this technique, they able to reduce over watering already saturated soils, avoid watering at the wrong time of day, which could have decrease crop performance or destroy it. This Microcontroller based system can easily be improved by

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using other modern controllers like Arduino etc. which are much less costly but far more functional and eliminates the need of having a ADC. And this is basic but functional system with no controlled application from the user itself.

In [5] Automatic sprinkler systems consist of a configuration of water piping to which are connected to automatic sprinkler heads, devices which open discharge water in a specified pattern and density over a designated area. Sprinkler systems reduce the wastage of water by distributing it evenly and more efficiently than manual means. On the international market the Sprinkler technology is evolving fast and the need to preserve natural resource (water) is a reason for it. Water sprinkler of various types, designs along with sophisticated gadgets are readily available.

3. PROBLEM STATEMENT

This system focuses on a smart irrigation wireless control system and check water condition with live streaming on the ground using android application which is cost effective. This system has wireless sensor network for real time sensing which is also check the soil type, crops type level and provide details to farmer. Based on the details farmer can decide the irrigation for ground and control of an irrigation system using android application. Android application to decide when and how to leave the water. It can be sent notifications each and every activity and some error connection or any problems identify then it can be sent an alert notification to a farmer. So water wastage, soil moisture and set time to leave the water like alarm system can be handled using android application.

4. PROPOSED SYSTEM

Automatic sprinkler systems consist of a configuration of water piping to which are connected to automatic sprinkler heads, devices which open discharge water in a specified pattern and density over a designated area. Sprinkler systems reduce the wastage of water by distributing it evenly and more efficiently than manual means. On the international market the Sprinkler technology is evolving fast and the need to preserve natural resource (water) is a reason for it. Water sprinkler of various types, designs along with sophisticated gadgets are readily available.

The system has three major parts; Water flow sensing part, control section and the output section. When water flows through the rotor, rotor rolls. Its speed changes with different rate of flow. The hall-effect sensor outputs the corresponding pulse signal. The control unit was achieved using ATMega328 microcontroller based on Arduino platform. The output is irrigation system which is controlled by the android device by switching it on and off depending on the soil moisture contents. Two stages of design were undertaken; hardware and software.
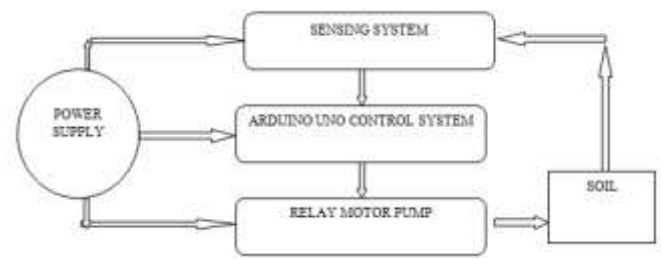

Fig 1: Block diagram of the irrigation system.

The main working principle behind this system is in connecting the soil moisture sensor, which was previously embedded into the plant, to the Arduino microcontroller, which is also connected to other electronic components. Measurement of soil moisture is done by the sensor which forwards the information and parameters regarding the soil moisture to the microcontroller, which controls the pump. If the level of soil moisture drops below a certain value, the microcontroller sends the signal to the Android device which then runs a pump and certain amount of water is delivered to the plant. Once the enough water is delivered, the pump stops doing its work. Power supply has a task to power the complete system and the recommended voltage should respect the input supply range for the microcontroller, that is, from 7V to 12V.

Used in the four-line sprinkler fields. Set up Arduino and connect to the Android device using the Bluetooth module. After starting the motor using the Android app, the water flow sensor will check if there is water in the water storage. If there is no water in the water storage, the water flow sensor will show that there is no water in the water storage on your Android device. If there is enough water in water storage then it will go to water sprinkler then soil moisture sensor will detect whether the soil needs water or not. If the soil is dry, then the notification will be received on the App and if the soil is wet, then the notification will be on the app depending on notification we decide to irrigate the farm or not. But there are different kinds of ground types, so depending upon ground type we irrigate the farm. Our main aim is to use the app in this place to control the sprinkler water
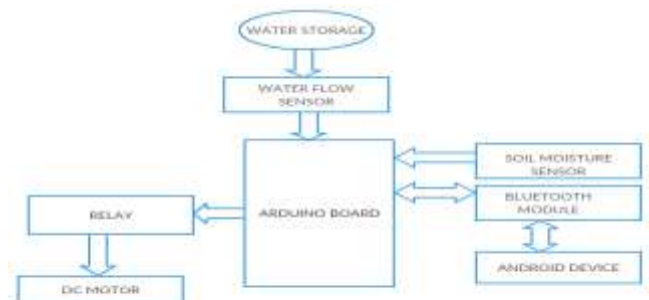

Fig 2: Proposed system design

5. CONCLUSIONS

Using this system, first save manpower, water to improve production and ultimately increase profit.

The automated irrigation system is feasible and cost effective for optimizing water resources for agricultural production. The system would provide feedback control system which will monitor and control all the activities of plant growth and irrigation system efficiently. The system mainly focuses on people engaged in the field of agriculture, where the system automates and regulates the watering to the crops. The moisture sensor senses the moisture level and if the moisture level is below the desired level then use android device to switched on motor. After the moisture level reaches the desired level the motor is switched off.

In the future, we can expand the system to that is can recognize more features and different level of sensors improving the field of irrigation system.

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