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IoT Based Smart Sprinkler Irrigation System Using GSM

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***Abstract*: Agriculture is a backbone of India and also it places a vital role in Indian economy. But Nowadays, the farmers are facing a main problem is lack of rains and scarcity of water. The major objective of this paper is to introduce an automated sprinkler for irrigation in land to assist in the production of crops and also know the exact field condition, which help to saving money, water, power and time. This project is about a moisture-sensing automatic plant watering system using Arduino UNO. Soil-moisture-based controllers use underground soil-moisture sensors to determine whether the area surrounding the sensor requires irrigation. The system reads the moisture content of the soil using soil moisture sensor. The moisture sensor checks humidity value. If the threshold value becomes low then the corresponding solenoid valve is opened. When the moisture level rises above the set point, the system switches off the valve. It can be connected to up to 4- humidity sensors where it continuously monitors humidity level under the soil/tree and displays using IoT device.**

***Keywords*: Agriculture, IOT device, Efficiency and Smartphone**

1. Introduction

Smart irrigation conserves water and can help meet federally mandated goals. Smart irrigation controllers provide an alternative to conventional timer-based systems, with demonstrated water savings of between 20% and 40%. The soil moisture based irrigation control uses Tensiometric and Volumetric techniques, which are relatively simple but these quantities are related through a soil water characteristic curve that is specific to a soil type. Also the sensors used require routine maintenance for proper performance. Intelligent automatic plant irrigation system concentrates watering plants regularly without human monitoring using a moisture sensor. The circuit is built around a comparator Op-amp (LM324) and a timer which drives a relay to switch on a motor. The system uses a hardware component, which is subjected to variation with the environmental conditions. A real-time wireless smart sensor array for scheduling irrigation prototyped a real-time, smart sensor array for measuring soil moisture and soil temperature that uses off-the-shelf components was developed and evaluated for scheduling irrigation in cotton. This system is specific for a crop and hence its usage is limited. Proper scheduling of irrigation is critical for efficient water management in crop production, particularly under conditions of water scarcity. The effects of the applied amount of irrigation water, irrigation frequency and water use are particularly important. To improve water efficiency there must be a proper irrigation scheduling strategy. So our project devices a simple system, using a microcontroller to automate the irrigation and watering of small potted plants or crops with minimal manual interventions. The IoT enabled controller allows the control the sprinkler remotely in the extraordinary situations. If the sprinkler is connected through it then it can be controlled remotely by user for certain emergency scenarios i.e. if the user is away from the system and there is a forecast of heavy thunderstorm already then, he/she can stop the sprinkler from watering at all us using any internet connected device e.g. smartphone or computer etc. This way wastage of water is prevented and overwatering of plant, which may be harmful, is ceased. Automated irrigation systems avoid watering wrong time of the day if the soil is moist.

2. Objectives of the project

Aim is to develop a smart irrigation system to provide irrigation system which is automatic for the plants which help in saving water and money. The main objective is to apply the system for irrigation process remotely through IoT device. The main purpose is to make a farmer to save his energy, time and money.

3. Methodology

A. The proposed system consists following parts

- Soil moisture sensors
- Arduino Uno R3
- Solenoid valve
- Relay
- Pipes
- Wireless device

A pipe is connected to the water resource which is then connected to the solenoid valve. A relay holds 3 moisture sensors as maximum. Moisture sensor detects the moisture content of the soil, and when the threshold value becomes low, automatically the solenoid valve gets opened. By this the water flows happens and reaches the plant through sprinklers. The controller can send or receive data from the server at any given moment. The controller used here is Arduino. Arduino is chosen as it is widely used for research purposes and different sensors and hardware are easy to interface. The soil

moisture/humidity sensor uses 0.4 mA of current so chance of loading effect is very less. The solenoid valve requires 24V of power while the controller can only output 5V. So, the valve is given external power. The IoT module is connected to Arduino which takes 3.3V-5V as input. It shows moisture content is percentage as programmed. . The system is built as a low-cost model as compared to the earlier sprinkler systems. The IoT feature in the present system can be an additional advantage as the user, from anywhere in the world, based on any forecast of thunderstorm can seize the watering process from a remote area, in the process saving a lot of water and preventing the death of plants through overwatering.

B. System architecture

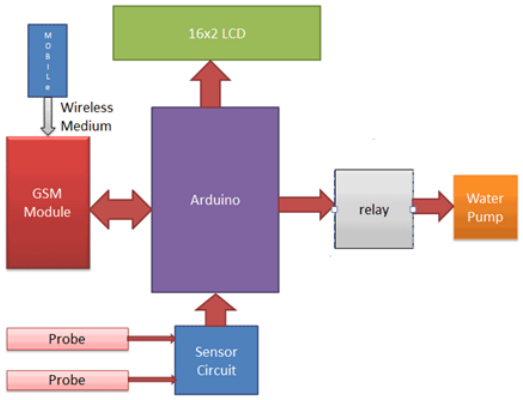

Fig. 1. System architecture

C. Hardware components

1) Arduino

Arduino is an open-source hardware platform that is being used by people around the globe for building electronics projects. It is an integrated platform which contains both a physical programmable circuit otherwise known as microcontroller and a software (or IDE) that you can run on your computer to write and upload the code onto the physical board. Arduino Board is quite popular among many people who want to get started with electronics, and unlike other embedded system boards Arduino does not require any additional hardware to upload the code (generally known as programmer). The Arduino Program can be written and uploaded using the Arduino IDE that needs just an USB cable to connect. Since the interface is simple and complicacies are less, Arduino is preferred by most of the aspiring engineers.

2) Soil moisture sensors

Soil moisture sensors measure the volumetric water content in soil. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighting of a sample, soil moisture sensors measure the volumetric water content indirectly by using some other property of the soil, such as electrical resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content. The relation between the measured property and soil moisture must be calibrated and may vary depending on environmental factors such as soil type, temperature, or electric conductivity.

3) Solenoid valve

A Solenoid valve is an electromechanical device in which the solenoid uses an electric current to generate a magnetic field and thereby operate a mechanism which regulates the opening of fluid flow in a valve.

4. Conclusion

The smart irrigation system implemented is cost effective for optimizing water resources for agricultural production. The proposed system can be used to switch on/off the water sprinkler depending on the soil moisture levels thereby making the process simpler to use. Through this project it can be concluded that there can be considerable development in irrigation with those of IOT and Wireless medium. Thus this system is a solution to the problems faced in the existing process of irrigation.

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