

Smart Irrigation Robot for Agricultural and Industrial Purpose

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ABSTRACT

The project presents the use of correct soil moisture sensors which helps to ease out the pain to monitor and keep records about the changes in soil moisture. Using the Arduino Mega microcontroller with Light-Depended Resistor sensor, moisture sensor, and temperature sensor, the temperature is measured and analyzed. The soil for a certain duration provides information related to the moisture status of the soil. The Arduino Mega will collect and process the data received from the Sensors. When a threshold moisture level of the soil is reached, the water will supply accordingly. This is essential because water must be provided to the plant at a particular time for a good yield. This project is highly used for farmers, Nursery professionals by eradicating traditional or manual methods of irrigation systems. The smart irrigation system is an automatic irrigation system which is being widely used in the field of agriculture. Irrigation is practiced in farms where there is a scarcity of water. This smart irrigation system is a farmer-friendly irrigation system, which is completely automated. This system runs without intervention of humans. This smart irrigation system, using Arduino-Uno, checks the moisture level in the soil. If the moisture level in the soil is low, it automatically sends an alert message and turns on the water motor to flow water to the soil. If the moisture level in the soil is sufficient, it switches off the motor. This system helps in agricultural crop growth and soil maintenance. The smart irrigation system reduces the effect caused by insufficient rainfall. This irrigation system prevents excess of water flowing into the soil which causes a wastage of water, electricity and damage to the soil, effectively.

Keyword : - Smart Irrigation Robot for Multi Purpose, Problem Statement, Proposed System Architecture and it's different software and hardware component

1. Introduction.

Smart Agricultural Systems have advanced rapidly in recent decades. Demonstrate the importance of agriculture over the world. In India, for example, over 70% of the population is reliant on the critical agricultural industry [1]. Irrigation systems in the past relied on mills to water the land using traditional ways without knowing the proper quantities of these crops. These outdated systems are a major source of water waste, resulting in the destruction of some crops due to a lack of sufficient water. However, recent technical advancements have resulted in unique irrigation systems that do not require the farmer to intervene in the irrigation process[2]. The project's expected outcomes are to make the irrigation system easier to use and understand by constructing and developing the entire automatic irrigation system, as well as to improve crop production by decreasing overwatering from saturated soil. It can prevent irrigation on the wrong day, to switch engine ON or OFF by using the irrigation system, the controller will operate to switch the engine, so no need for employers, to reduce operational errors caused by employees as much as possible, and to conserve water from waste The need for agricultural outputs is expanding at a rapid rate as the world's population grows. Furthermore, the farmer's potential and abilities in the agriculture field are dwindling, owing to various enterprises that draw workers away from the farming zone (28 percent of Japanese farmers are over 65 years old) [3].

Agriculture's income must continue to grow since the world's population is expected to rise from 6.8 billion in 2013 to over 10 billion by 2050. With the decline of a farmer's potential, efficiency becomes a critical requirement [4].

1.1 Problem Statement

Agriculture is vital to the economies of many countries. To get the greatest results from this study, it's crucial to concentrate on a few key factors like the right quantity of electricity, water supply, and a sufficient watering schedule for the crops. Farmers, particularly those in poverty, are having difficulty reaching these standards. The goal of this project is to create an automated irrigation system that can be operated via a mobile application. This system will operate to reduce the number of workers in a crop field, conserve water and electricity, increase agricultural production with modest amounts of water, reduce manual intervention in watering operations by improving watering speed, and protect plants from fungi. All of these characteristics make this research available choice for improving agricultural and irrigation efficiency.

1.2 Proposed System Architecture

Direct watering to the root zone keeps the soil surface dry. Real-time soil moisture and weather monitors — the former via microwave remote sensing — are emerging technologies that could aid with irrigation scheduling. More efficient agricultural water use can also be achieved by rain water gathering, efficient irrigation water conveyance, and the use of reclaimed water.

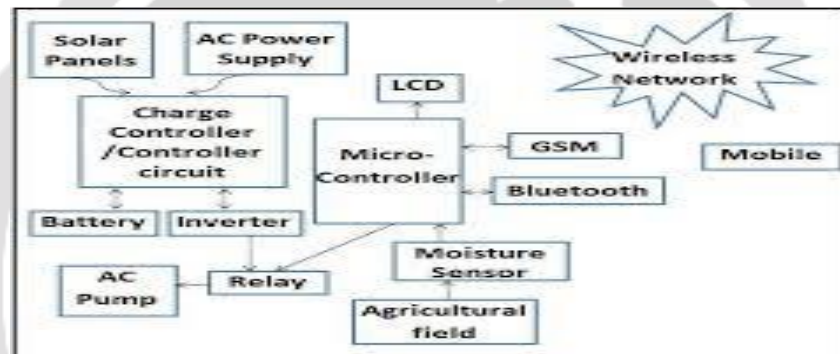


Fig – 1 Block diagram at Irrigation end (user end).

2. Components.

Hardware and software Components –

- i. Four DC motor
- ii. Bluetooth module
- iii. .Battery 12v
- iv. Water pump
- v. Sprinkler
- vi. Water tank
- vii. Waterproof Robot Body
- viii. Arduino uno Microcontroller
- ix. Sensors

2.1 Bluetooth Module

Introduction Bluetooth is a high-speed, low-power microwave wireless link technology, designed to connect phones, laptops and other portable equipment together with little or no work by the use. Unlike infra-red, Bluetooth does not require line-of-sight positioning of connected units. The technology uses modifications of existing wireless LAN techniques but is most notable for its small size and low cost shown in Figure 2. The current prototype circuits are contained on a circuit board 0.9cm square, with a much smaller single chip version in development. The fundamental strength of Bluetooth wireless technology is the ability to simultaneously handle data and voice transmissions, which provides users with variety of innovative solutions.

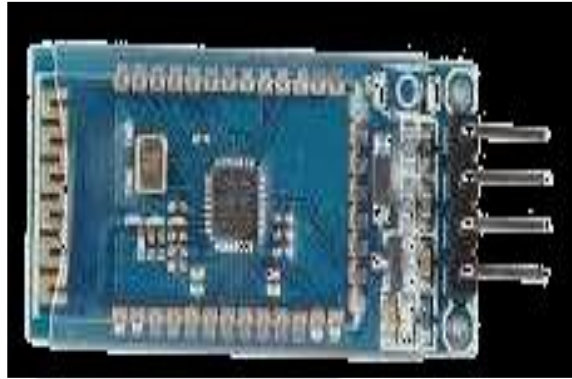


Fig – 2 Bluetooth Module

2.2 Arduino Uno Microcontroller

Arduino is an open-source electronics platform based on easy-to-use hardware and software. Arduino boards are able to read inputs – light on a sensor, a finger on a button – and turn it into an output – activating a motor, turning on an LED. A microcontroller is a small computer on a single integrated circuit. In modern terminology, it is a system on a chip. It contains one or more CPUs along with memory and programmable input / output peripherals. Microcontrollers are designed for embedded application. They are used in automatically controlled products and devices, such as automobile engine control systems, implantable medical devices remote controls, office machines and other embedded systems



Fig – 3 Arduino uno Microcontroller

3. Robot.

We use the robot to check the crop's status by mounting a camera on the robot's head, which allows us to monitor the robot's position as well as the crop's condition on our PC. Because the robot's primary duty is to move around the field and monitor the crop's condition before forwarding the data to the camera, which is controlled by the user, we can utilize an 8051 microcontroller as shown in Fig. 8. In the robotics end, we're also employing a DC motor. The DC motor operates on the electro-magnetic induction principle.



Fig – 4 Multipurpose Robot

A fully self-contained robot can:

- Learn more about the environment.
- Working without human intervention for an extended period of time
- Without human assistance, move all or part of oneself within its operational environment.
- Unless it is part of its design standards, avoid scenarios that are detrimental to people, property, or itself.

3.1 Power Supply

To reduce 230v to the required voltage, a step down transformer is needed. Fig. 5 depicts the voltage levels.

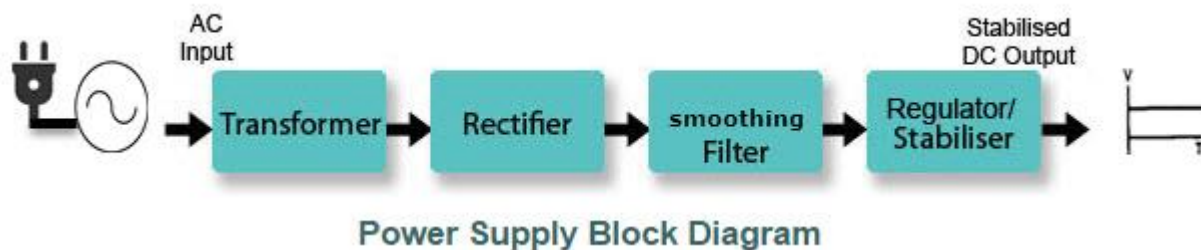


Fig – 5 Power Supply

4. Advantages.

- **Water efficiency:** Robotic irrigation systems use precise sensors and algorithms to deliver the right amount of water directly to the plant roots, minimizing water waste and optimizing water usage.
- **Labour-saving:** These systems operate autonomously, reducing the need for manual labour and allowing farmers to allocate their time and efforts to other essential tasks on the farm
- **Sustainability:** Robotic irrigation promotes sustainable farming practices by reducing water consumption, minimizing the environmental impact of irrigation, and contributing to the conservation of natural resources.
- **Real-time monitoring:** These systems often come equipped with sensors and monitoring capabilities that provide real-time data on soil moisture, temperature, and other relevant factors, allowing for prompt adjustments and interventions when necessary.

5 Application of Smart Robot.

- Can be used for irrigating agricultural plants.
- Can be used at industries at different industrial departments.
- It can transfer different instrument from one place to another in industries.
- It can also transfer vegetables and fruits by placing tray on it's top side.

6 Result and Discussion.

The target was achieved after completing the plan and collecting the components of the smart irrigation system. In addition, all of the requirements were met in order to complete this smart irrigation system and bring it to full production and completion. After that, the system was put to the test, and the ultimate result was exactly what was expected. The system will not function unless two or three moisture sensors from any line of the three fields send a signal to the microcontroller indicating that the soil is dry and that the crop requires water. When the sign reaches the microcontroller, it will send a command to the line field valve's relay to be energized to open the valve, as well as a command to the pump's relay to exchange it straight to irrigate that field. Also, if two or three of the three plants' moisture sensors are operational, all three fields can be irrigated at the same time. As a result, all solenoid valve relays may be triggered, opening all valves and causing the pump to run to water all three plants. Furthermore, this smart irrigation system has been set up such that it will not work if it rains, as the rainy sensor will activate and send a signal to Arduino to turn off the water pump and close all valves. Furthermore, the system will not function during the day since the mild sensor will activate during the day, causing the plant's value to be closed and the pump to be turned off.

7. Conclusion.

The proposed controller eliminates the on-place switching mechanism used by the farmers to ON/OFF the irrigation system. Integrating features of all the hardware components used have been developed in it. Occurrence of each module has been logical out and located prudently, thus donating to the best working of the unit. Next, using highly advanced IC's with the help of rising technology, the project has been really employed. The microcomputer irrigation system applied was found to be feasible and cost actual for changing water resource for agricultural manufacture. This irrigation system permits cultivation in places with aquatic insufficiency thereby cultivating sustainability. The micro irrigation system progressive proves that the use of water can be weakened for a given amount of fresh biomass manufacture.

8. Future Work.

Irrigation is a process of providing the desire amounts of water to the agricultural land. This process is very beneficial in minimizing runoffs or drought situations for the croup's cultivation. Due to alarming changes in the climate, farmers cannot rely on natural rainwater. Irrigation is important to yield good quality crops in the seasonable or non-seasonable period. For modern agriculture, a smart irrigation system is one of the best techniques that give more production in minimum duration. To many extend, this smart irrigation system is designed and fully automated to minimize manual handling in agriculture. And one of the good things is that it is very comfortable for users (or farmers) to understand the concept of Arduino uno and sensors for smart irrigation. It can help you to learn how various sensors can be deployed and utilization of their data to generate events and control irrigation systems.

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