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Automatic Sprinkler System using Arduino

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Abstract: ***This report investigates the implementation and benefits of an Automatic Sprinkler System driven by the Arduino Uno microcontroller in agricultural irrigation. The primary aim is to elucidate the functionality and practicality of this automated system in enhancing water efficiency and crop productivity. Through accessible language and technical explanations, the report explores the system's design, operation, and integration with sensors for optimal performance. Emphasis is placed on the system's ability to provide precise watering, customizable scheduling, and water conservation, thereby addressing critical challenges in modern agriculture. By examining the technical aspects and real-world implications, this report underscores the transformative potential of automated irrigation systems in promoting sustainable farming practices.***.

Keyword: Arduino Uno, IoT, microcontroller, moisture sensor, sensors, wireless module

I. INTRODUCTION

In the world of farming, where water is crucial for growing crops, there's a new way to make things easier: by using technology to control irrigation systems automatically. This report focuses on a particular system called an Automatic Sprinkler System, which is powered by a device called Arduino Uno—a small computer that's easy to use and widely available.

The goal of this report is to explain how this system works, without getting too technical. We'll explore how it helps farmers by making watering more precise, letting them choose when and how much water their plants need, and saving water in the process.

We'll take a closer look at how the system is set up, how it's programmed to work, and how sensors are used to make sure everything runs smoothly. Along the way, we'll also talk about some of the challenges farmers might face when using this technology.

By keeping things simple and practical, this report aims to show how automated irrigation systems, like the one powered by Arduino Uno, can make a big difference in agriculture. As the world's population grows and resources become scarcer, finding smart ways to grow crops becomes more important than ever. This report highlights how technology can play a key role in making farming more efficient and sustainable.

Utilizing specialized drip irrigation systems offers numerous benefits for gardeners. Firstly, by delivering water directly to each plant's root ball, these systems prevent weed seeds from germinating, reducing the need for frequent weeding. Moreover, targeting the roots prevents water from accumulating on foliage, thus minimizing the risk of leaf diseases such as blight.

II. LITERATURE REVIEW

There is a lot of research paper that have worked automatic sprinkler system using Arduino.

1..Md. Wasi-ur-Rahman, Mohammad Tanvir Rahman, TareqHasan Khan and S.M. **[1]**

Lutfulkabir,(2009)"Design of an Intelligent SMS based Remote Metering System",Proceedings of the IEEE International Conference on Information and Automation pp. 1040-1043 Data mining algorithm are used to take decisions on drip irrigation system. Automated drip irrigation system having WSN placed in all over farm and different type of sensors like soil moisture sensor, wind direction, wind speed, soil temperature gives reading to control station and base station. WSN uses ad hoc network which gives self-configuration and flexibility.

Abhinav Rajpal "Microcontroller based Automatic irrigation system with Moisture Sensors". **[2]**

The system used provides a reading of the temperature of the atmosphere along with the humidity contained in the soil. Arduino receives the signal of the moisture sensors this is achieved by the two stiffs is also connected to a microcontroller to display soil and water pump status by usinga too stiff metallic rod inserted into the field this is the sensing arrangement for the system.

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Md. Wasi-ur-Rahman represent Design system based on order no GSM module and moisture sensor. **[3]**
This system consists of 9 hardware parts that illustrate the mechanism of the system in terms of sending SMS from the Mobile Phone (MP) to the Arduino Board (AB) for controlling the Water Pump (WP), as well as receiving alert messages from the AB.Hardware components are connected to Arduino Mega via wires, and the Arduino platform
supplied by a 5V DC adapter

Shriya Thawali represents a robot capable of performing operations like automatic **[4]**
ploughing, seed dispensing and pesticide spraying. Control of his agro-bot will be wireless. Design and analyze a real-time system for this robot give a solution and proposed a model which can be used in the real-time field. the robot Analyzed the design of the plough tool and developed a real-time system. The robotic system is built using high torque DC motor, communication module, relay driver circuit, Battery package, microcontroller. The mechanical parts of the robot are designed with the help of Pro-E Design Software. With the help of this type of robot, the author implements minimize some problem in the agriculture field.

. Vasif Ahmed, Siddharth A. Ladhake,(2010) "Design of Ultra Low Cost Cell Phone **[5]**
Based Embedded System for Irrigation", on International Conference on Machine Vision and Human Machine Interface ,vol.20,pp 40-45. Wireless sensor network with valve control unit is developed with actuator hardware and software. Irrigation is control by actuator. Web application is used for manual control and schedule irrigation timing. Water meter indicate the requirement of water. Node unit contain soil moisture sensor and actuator. Packet loss between node and actuator communication degrade performance of system. Power requirement for actuator and node unit is high. Water requirement for different crop is different also depends on other factor like soil type, temperature, etc. This system measures only soil moisture parameter to take irrigation decision.

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III. NECESSITY OF THE PROJECT

Population is increasing day by day and hence our natural resources are exhausting swiftly. It is our accountability as an individual to help and save our natural resources. Water scarcity is the main muddle in today's era. Agriculture sector is budding r rapidly and hence a lot of water is needed for irrigation. A large amount of water is unnecessarily wasted while irrigating the fields due to water logging. The growth of the crop is also stalled since; passable amount of water is not given to the crop. So, an automatic plant Irrigation system will aid to save a lot of water and will safeguard vigorous growth of the crop. This will also eliminate the necessity of workers on the field and also saves a lot of time.

IV. BLOCK DIAGRAM

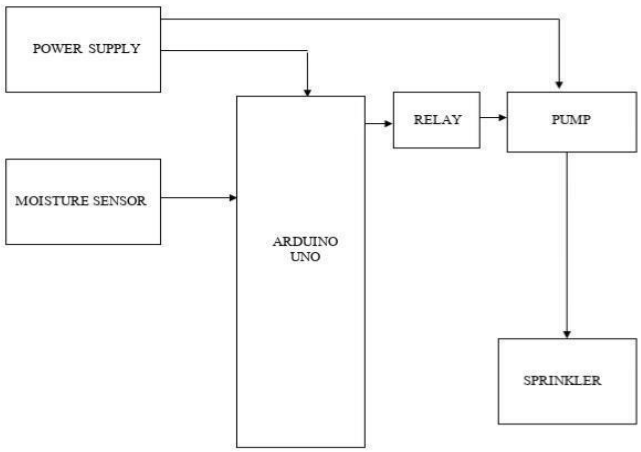

Fig No 1. Block Diagram

V.PLANNING

Analysis of the situation and the exact problem faced through discussions with the project guide. We will use different technologies in the system.
We can implement the project with the help of our guide and the specification of the program were decided by the guide. Use of moisture sensor to interface the computer and embedded system meant for process and control.
Testing and development still underway to enhance the user interface.

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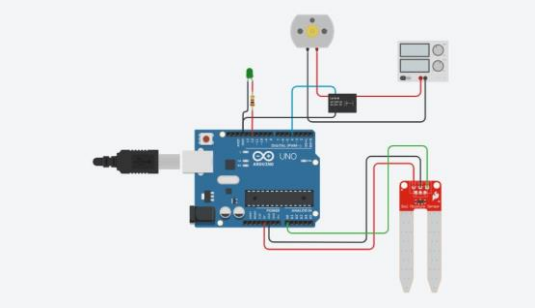

Fig No 2. Schematic diagram of project

VI .Working Methodology

This project is based on an automatic sprinkler watering system. The automatic system consists of two main parts, the first is the relay module and the second is the watering pump. The relay work as a electric switch which is automatically operate. Relay uses an electromagnet to operate the switch from OFF to ON or ON to OFF.

All the hardware will be connected to an Arduino board, which is the microcontroller that use to control all the hardware attached to it.

The hardware includes the Arduino board, moisture sensor, pump, and relay module. This project is a complete example used for daily life. In this system, the centre is an Arduino board All requirement parts are connected to atmega 328. The soil moisture sensor senses moisture level in the soil and is transferred the data to the Arduino board after that process is dependent on it.

Electric signal control by relay switch that passes through the water pump. Arduino received signal from the moisture sensor. When the moisture level is a negative value, the Arduino UNO board sends a signal to the relay module. Then the relay module gets automatically open the path for the electricity to pass through the water pump to water the plant. After the moisture sensor detects sufficient water in the soil, the relay will stop as well as the water pump will be stopped immediately.

VII . COMPONENTS

ARDUINO

Arduino is an open-source electronics platform based on easy-to-use hardware and software. It consists of a microcontroller board and a development environment, making it accessible for hobbyists, students, and professionals alike. The board can be programmed to interact with various sensors, actuators, and other electronic components, allowing users to create a wide range of projects, from simple gadgets to complex automation systems. Arduino's versatility, affordability, and large community support make it a popular choice for research and innovation in fields such as robotics, Internet of Things (IoT), wearable technology, and more.Arduino board designs use a Variety of microprocessors and controllers. The boards are

Equipped with sets of digital and analog input/output (I/O) pins That may be interfaced to various expansion boards

Fig NO 2. Aurdino

RELAY

A relay module is an electromechanical device used to control high-power electrical circuits with low-power signals. It consists of a coil, which when energized, creates a magnetic field to switch the contacts, thus opening or closing the circuit. This module typically includes terminals for input and output connections, allowing it to interface with microcontrollers or other control systems. It is commonly used in automation, robotics, home appliances, and industrial applications for tasks such as switching lights, motors, and other electrical devices.

Fig No.3- Relay

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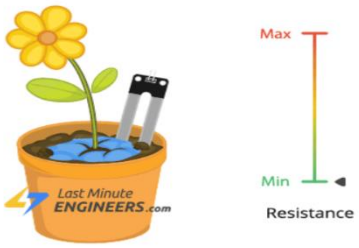
WATER PUMP

A 230v dc motor is used with the pump. The pump is turned on and off automatically with the help of the relay. The values of the moisture content are read by the Arduino board and are compared with the reference value and thereby motor driver circuit is activated.

MOISTURE SENSOR

Moisture sensors are electronic devices used to measure the moisture content of soil. They typically consist of two metal probes inserted into the soil, which measure the electrical conductivity between them. As soil moisture increases, conductivity rises due to the presence of ions in the water. This change in conductivity is then converted into a moisture reading. Moisture sensors offer real-time data on soil moisture levels, enabling precise irrigation management and water conservation in agricultural and gardening applications.



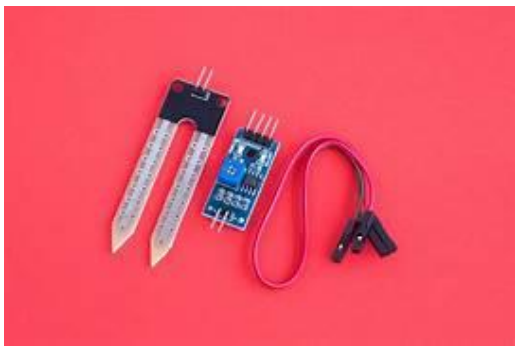


Fig NO 4 . MOISTURE SENSOR

VIII. OBSERVATIONS

Observing the automation of a sprinkler system using Arduino for a research paper is a fascinating topic. You could explore how Arduino microcontrollers are utilized to automate irrigation processes, optimizing water usage and enhancing efficiency in agriculture or landscaping. Additionally, you could delve into the technical aspects of the system, such as sensor integration, programming logic, and data analysis. It's a great opportunity to showcase the practical applications of technology in sustainable practices.

IX. RESULT

Two different soils are used to test the model of automatic plant irrigation system. The moisture content of both the soils are sensed and matched with the reference values. In the first soil, the moisture content as sensed by the probes is less, so the pump automatically provides water to the crop till it reaches the limit. Coming to the second soil, the soil is already wet, i.e. moisture content is high. In this case, no water is provided to the crop. Thus, the system functions according to the values sensed from the soil till it reaches the limit.

Moisture in soil	Relay Switch	Pump
wetness	OFF	OFF
Dryness	ON	ON

Fig No 5. Table of the Project Result

X. CONCLUSION

Therefore the " Automated Irrigation system rested on soil humidity using Arduino " has been designed and tested successfully. It has been developed by integrated features of all the attack factors used. In this figure is showing leg illustration of design. Presence of every module has been reasoned out and placed precisely, therefore contributing to the swish working of the unit. therefore, the Arduino Based Automatic Plant Watering System has been designed and tested successfully. The system has been tested to serve automatically. The humidity detectors measure the humidity position(water content) of the different shops. However, the humidity detector sends the signal to the Arduino board which triggers the Water Pump to turn ON and supply the water to separate factory using the Rotating Platform/ Sprinkler, If the humidity position is goes to be below the asked and limited position. When the asked humidity position is reached, the system halts on its own and the water Pump is turned OFF. therefore, the functionality

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of the entire system has been tested completely and it's said to function successfully.

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