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IRRIGATION USING WASTE WATER

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Abstract:
Automatic irrigation systems have transformed the way we irrigate crops and plants. The traditional method of irrigation is labor-intensive and inefficient, and hence there is a need for an automatic irrigation system that can monitor and regulate the water requirements of crops. The benefits of an automatic irrigation system are numerous, including water conservation, labor, and time-saving, and ensuring that crops receive the correct amount of water. The system uses Arduino Uno, Rain sensor, Moisture sensor, DHT11 sensor, Motors and Relays. However, the installation and maintenance of the system can be expensive, and a power source is required to operate the system, which can be challenging in remote areas.
Keywords: Arduino Uno, DHT11, Sensors, Motors

I. INTRODUCTION

Smart irrigation system is an advanced technique used to optimize the irrigation process, reduce water wastage, and improve crop yield. The traditional irrigation methods are not only inefficient but also require a lot of labor, which increases the production costs. The smart irrigation system uses various sensors, controllers, and algorithms to determine the water requirements of the crops and deliver water in the most efficient manner. This research paper aims to explore the benefits and drawbacks of smart irrigation systems, the different components used in the system, and their functions. The paper will also discuss the implementation process, the challenges faced during installation, and maintenance practices. Smart irrigation systems have several advantages over traditional irrigation methods. They help conserve water by ensuring that crops receive the required amount of water without wastage. They also reduce the labor costs and improve the crop yield by delivering water in the most efficient manner. However, the initial cost of installation is high, and the system requires a stable power source to function correctly. The smart irrigation system comprises several components, including soil moisture sensors, weather stations, controllers, and valves. The soil moisture sensors are used to measure the moisture content in the soil, and the weather stations provide data on the weather conditions. The controllers use the data from the sensors and weather stations to determine the water requirements of the crops and activate the valves to deliver water. The installation of the smart irrigation system requires careful tenancy of the system require a considerable investment, the benefits in terms of water conservation, labor, and improved crop yield make it a worthwhile investment for farmers. Planning and design to ensure that the system meets the water requirements of the crops. The system needs to be tested to ensure that it is functioning correctly, and regular maintenance practices are required to ensure optimal performance.
In conclusion, smart irrigation systems are an effective solution for farmers looking to optimize their irrigation process, reduce water wastage, and improve crop yield. The system comprises several components that work together to ensure efficient water delivery to the crops.

II. COMPONENTS

A. Arduino Uno
The Arduino Uno is an open-source micro-controller board that has gained popularity for its simplicity and versatility in electronic projects. It is based on the ATmega328P micro-controller and comes with a variety of input and output pins, making it suitable for a wide range of applications.

Arduino Uno is designed for both beginners and experienced electronics enthusiasts. It provides a user-friendly environment for programming and prototyping. The board can be easily connected to a computer via a USB cable, allowing users to write and upload their own code.
The Arduino Uno board has 14 digital input/output pins, 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, and an ICSP header. These features enable users to connect various components such as sensors, actuators, displays, and communication modules to create interactive projects.

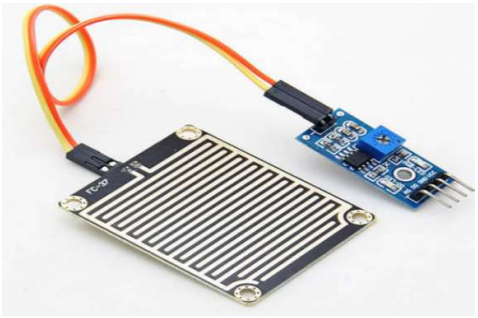
B. Sensors:

1)Rain Sensor: A rain sensor is a device that detects precipitation and triggers an action, such as turning off an irrigation system, closing a skylight, or activating a warning signal. It is an important component of many environmental monitoring systems and is widely used in agriculture, construction, and home automation applications.

Rain sensors work by detecting the presence of moisture in the air. There are two types of rain sensors: contact and non-contact. Contact sensors use physical contact to detect the presence of rain, while non-contact sensors use optical or electromagnetic waves to detect the reflection or absorption of raindrops.

Contact rain sensors typically consist of two conductive plates that are separated by a small gap. When rain falls on the plates, it bridges the gap and completes a circuit, triggering the action. Non-contact sensors use various methods, such as infrared, ultrasonic, or radar, to detect the presence of rain.

Rain sensors have several advantages, such as conserving water by turning off an irrigation system during rainfall, reducing the risk of property damage by closing skylights during a storm, and improving safety by activating warning signals during hazardous weather conditions. They are also easy to install and require minimal maintenance.



2)DHT11 Sensor:The DHT11 sensor is a low-cost digital temperature and humidity sensor. It is commonly used in a range of applications, including environmental monitoring, indoor climate control, and weather forecasting. The sensor is easy to use and can be interfaced with micro-controllers, such as Arduino and Raspberry Pi.

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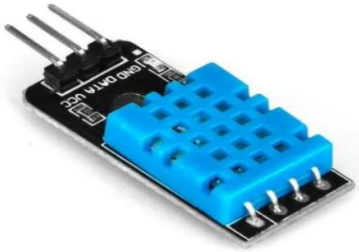
The DHT11 sensor comprises a thermistor and a capacitive humidity sensor, which are integrated into a single module. The sensor provides digital output and measures temperature in the range of 0 to 50°C with an accuracy of ±2°C and humidity in the range of 20 to 90% RH with an accuracy of ±5%.

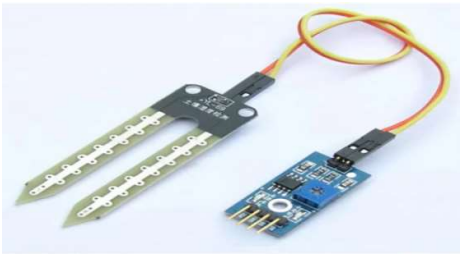
One of the benefits of the DHT11 sensor is its low cost. It is an affordable option for measuring temperature and humidity, making it accessible to hobbyists, students, and professionals alike. It also has a compact design, which makes it easy to integrate into a range of projects.
The DHT11 sensor is also easy to use. It requires only three pins to interface with a micro-controller - power, ground, and data. The data is provided in a digital format, which simplifies the programming required to read the sensor output.



3)Moisture Sensor:A moisture sensor is an electronic device that measures the moisture content in soil or other materials. It is commonly used in agriculture and gardening to monitor soil moisture levels and ensure optimal growing conditions for plants.
Moisture sensors work by measuring the electrical conductivity of the soil. Water is an excellent conductor of electricity, and as the soil moisture level increases, so does its electrical conductivity.
Moisture sensors typically use two or more probes inserted into the soil to measure the electrical resistance between them. The higher the resistance, the drier the soil, and the lower the resistance, the wetter the soil.

Moisture sensors come in various types, including capacitance sensors, tensiometers, and resistance sensors. Capacitance sensors measure the dielectric constant of the soil, which changes with the water content. Tensiometers measure the soil's ability to retain water by measuring the tension of the soil water, while resistance sensors measure the resistance of the soil.
Moisture sensors have several advantages in agriculture and gardening. They help farmers and gardeners to monitor soil moisture levels, and ensure optimal growing conditions for plants.

Overwatering can lead to root rot, while underwatering can lead to plant stress and poor growth. Moisture sensors help prevent these issues by providing real-time data on soil moisture levels.
Moisture sensors are also essential for water conservation efforts. Overwatering is not only wasteful but can also lead to soil erosion and nutrient leaching. By using moisture sensors to monitor soil moisture levels, farmers and gardeners can reduce water usage and promote sustainable farming practices.



4) Water level sensor:A water level sensor is a device designed to measure and detect the level of water in a tank, reservoir, or any other water-containing system. It is a crucial component in various applications, including industrial processes, agriculture, environmental monitoring, and home automation.

There are different types of water level sensors available, each utilizing different principles to determine water levels. One commonly used type is the float switch. It consists of a buoyant float attached to a lever arm. As the water level rises or falls, the float moves accordingly, causing the lever arm to activate a switch. This switch can be connected to a control system, such as an Arduino Uno, to monitor and respond to changes in water level.

The Arduino Uno is a micro-controller board that provides a programmable platform for interacting with various sensors, including water level sensors. It offers input/output pins that can be used to interface with the float switch and other components. By connecting the float switch to the appropriate digital input pin of the Arduino Uno, the system can detect changes in the water level.
To utilize the water level sensor with the Arduino Uno, you would typically write a program using the Arduino IDE. The program can include code that reads the status of the digital input pin connected to the float switch using the digitalRead() function. Based on the water level information received, the Arduino can perform specific actions, such as activating a motor or triggering an alarm, to respond to the water level changes.

When the water level rises above or falls below a certain threshold, the Arduino Uno can execute the desired logic to control a motor that pumps water in or out of the system, depending on the application requirements. The motor can be connected to the Arduino Uno via appropriate electronic components like relays or motor drivers to enable its control.

III.WORKING

When integrating an Arduino Uno with a humidity sensor, rain sensor, soil moisture sensor, buzzer, and a motor pump, a comprehensive system can be created to automate irrigation based on environmental conditions. The humidity sensor can measure the moisture content in the air, while the rain sensor detects the presence of rain. The soil moisture sensor determines the moisture level in the soil.

By utilizing the Arduino Uno's input/output pins and programming capabilities, the system can continuously monitor these sensors. If the humidity level is low and the soil moisture is below a specified threshold, the system can activate the motor pump to provide irrigation to the plants. Additionally, if the rain sensor detects rainfall, the system can suspend irrigation temporarily to avoid overwatering.

To indicate system status or specific conditions, a buzzer can be integrated with the Arduino Uno. For instance, if the soil moisture drops critically low or the system encounters an error, the buzzer can sound an alarm. This alert can prompt the user to take necessary action or address any issues with the system.

By integrating an Arduino Uno with a water level sensor and a motor, an efficient system can be created to remove excess water from an agricultural field. The water level sensor, such as a float switch, detects the rising water level. The Arduino Uno, utilizing its input/output pins and programming capabilities, continuously monitors the sensor's status.

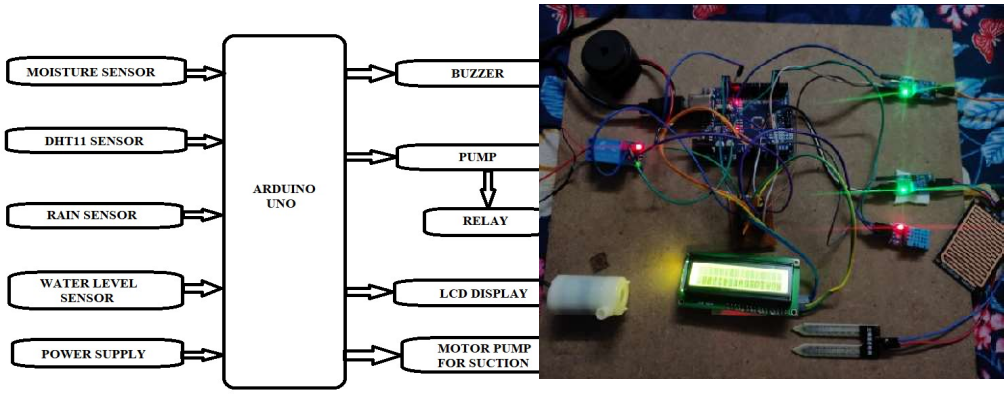
When the water level reaches a specified threshold, indicating excess water, the Arduino Uno triggers the motor. The motor is connected to a power supply and controlled by a relay module. The relay module acts as a switch to turn the motor on and off.

The Arduino Uno sends a signal to the relay module, activating it and starting the motor. The motor's function is to pump out the water from the field, preventing waterlogging and potential damage to crops. The motor continues running until the water level drops below the specified threshold. The waste water which is pumped out is again used for that field only, which results in irrigation using waste water.

This integration of the Arduino Uno, water level sensor, and motor provides an automated solution for water management in agricultural fields. It ensures that excessive water is efficiently removed, maintaining optimal soil conditions for crop growth and minimizing the risk of water-related damage.

By combining these components and utilizing appropriate programming logic, the Arduino Uno can create an efficient and automated irrigation system. This system ensures that plants receive adequate moisture based on environmental conditions, optimizing water usage and promoting healthy plant growth.

IV. MODELLING AND ANALYSIS



V. PROJECT RESULTS

The project main objective is to provide smart irrigation to a small agriculture field by detecting humidity, moisture, rain and temperature and provide water to the field and when water level rises in the field and to prevent damage to the crop due to excess water, the water is removed from the field using a suction motor pump.

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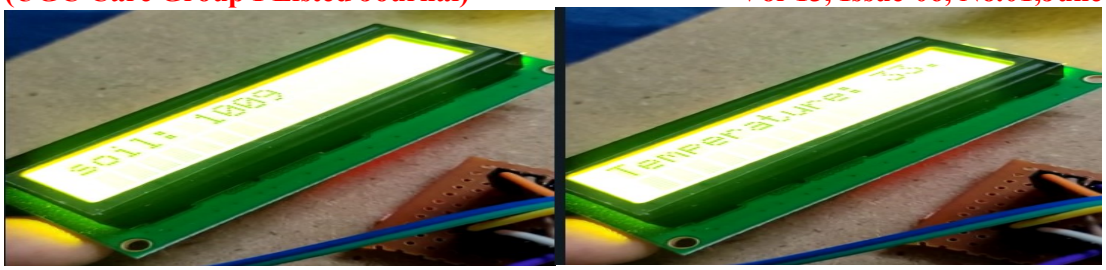

VI. CONCLUSION

In conclusion, a smart irrigation system offers significant benefits for efficient and effective water management in agriculture. By integrating components such as soil moisture sensors, weather sensors, and an Arduino Uno micro-controller, the system can monitor and analyse environmental data to optimize irrigation practices.

The Arduino Uno serves as the central control unit, collecting data from sensors and executing programmed logic to determine irrigation needs. Soil moisture sensors provide real-time information about soil moisture content, allowing for precise irrigation scheduling based on actual plant requirements.

Weather sensors enable the system to take into account external factors such as rainfall, temperature, and humidity. This data helps to adjust irrigation schedules accordingly, avoiding over watering and conserving water resources.

Through the integration of smart algorithms and automation, the system can adaptively regulate irrigation, ensuring that crops receive the right amount of water at the right time. This not only promotes healthy plant growth but also minimizes water wastage and reduces operational costs.

By leveraging the power of the Arduino Uno and intelligent sensor technology, a smart irrigation system can optimize water usage, conserve resources, and enhance agricultural productivity. The system's ability to monitor, analyse, and respond to environmental conditions in real-time makes it an invaluable tool in sustainable and efficient farming practices.

REFERENCES

[1] Naresh Muthunoori and P. Munaswamy, "Smart agriculture system using IOT technology", *International Journal of Recent Technology and Engineering*, vol. 7, no. 5, pp. 98-102, 2019.

Akash Raj N, Balaji Srinivasan, Deepit Abhishek D, Sarath Jeyavanth J, Vinith Kannan A, IoT based Agro Automation System using Machine Learning Algorithms, International Journal of Innovative Research in Science, Engineering and Technology November 2016, pp. 19938-19342