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SMART WATERING: CHANGING WATER SYSTEM WITH AR AND IOT

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Abstract. Drip irrigation has become a successful and sustainable method of agricultural water management, which optimizes crop productivity. In Irrigation system, water is provided to plants depending on the soil type. Two things are very important in agriculture, first is to get information about the fertility of soil and the other one is to measure the moisture content of the soil. This study combines the use of augmented reality (AR) and internet of things (IoT) tech- nologies to further improve the accuracy and efficacy of drip irrigation systems. IoT plays a vital role in drip irrigation with its network of interconnected devic- es and sensors. By deploying IoT-enabled smart sensors in agricultural fields, real-time data on soil moisture, humidity, temperature and weather conditions can be collected and analyzed. AR technology provides real-time visual over- lays and interactive guides that aid in the installation, monitoring and mainte- nance of drip irrigation systems. Using AR applications, Irrigation specialists and farmers can assess water flow rates, pressure levels and soil moisture data. The integration of AR technology into automated drip irrigation system has the potential to bring significant improvements to the agriculture industry. This proposed application provides information about the Moisture content of the soil using the Moisture sensor and waters the plants based on the readings. Here Arduino Uno, Moisture Sensor and other electronic tools are used to measure moisture content of the soil. An Augmented Reality prototype is proposed, us- ing Unity soft-ware to visualize the model [1][2]. The proposed integration of AR and IoT technologies provides significant benefits, including optimized wa- ter usage, enhanced crop yield and reduced operational cost.

Keywords: IoT, AR, Drip Irrigation, Arduino Uno, Moisture Sensor

1 Introduction

One of the nations with the largest population in the world is India. Agriculture is India's primary source of income, where 60- 70% of the economy depends on agricul- ture. There is a great need to modernize the conventional agricultural practices for better productivity, in order to sustain a healthy economy of the country. Unplanned water usage is causing the groundwater level to drop day by day. In addition, lack of rain leads to decrease in the amount of water on Earth. One of the major issues in the world, today is a lack of water.

The system's goal is to conserve energy and water resources. It can be operated manually or mechanically, sensing the water level which is cost and time efficient. This paper presents an intelligent system that automatically waters the plants when the soil moisture sensor detects

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insufficient amount of moisture in soil and shows it on LCD display and provides a prototype to visualize the agricultural field through AR tech- niques.

2 Literature Survey

[3]This paper discusses methods for preventing or reducing water waste in agricul- ture. A smart irrigation system controls the amount of water provided by using mois- ture sensors, temperature sensors, and humidity sensors. Neutron scattering technolo- gies are accurate but involve radiation threats and calibration challenges, whereas capacitive sensors are expensive and require frequent calibration with fluctuating temperature and soil type. The combination of an automated irrigation system and a cheap moisture sensor is suggested. [4] This study provides an intelligent system that forecasts soil moisture using data gathered from sensors placed in the field and online weather forecasts. The approach is built on machine learning techniques that were applied to the data from the sensor nodes and the weather forecast, leading to in- creased accuracy and reduced inaccuracy. The suggested method might assist in choosing irrigation practices that use the least amount of water possible. [6] This pro- ject consists of two parts: The Motor/Water Pump and the Sensors (Soil Moisture Sensor, Temperature and Humidity Sensor). The moisture sensors gauge the various plants' moisture content (or moisture level). The moisture sensor delivers the signal if it determines the moisture level is lower than expected. The microcontroller Node MCU ESP8266 is connected to the sensors and the water pump. The Microcontroller activates the Water Pump to switch ON and send the water to the designated plant upon receiving the signal. The mechanism shuts down automatically and the water pump is turned off when the required moisture level is reached. The temperature and humidity sensors take measurements to offer information for data logging and making decisions. Finally, the user receives an email with information about the current state of the plant. [7] This paper illustrated a smart garden using augmented reality. Also suggested, how to know the relationship among marker coordinates, the camera coor- dinates, and the screen coordinates is estimated by image analysis. The purpose of this study is to create a Smart Garden assistance system that can visualize farming pro- cesses using CGs and overlay them on a field where the operator is working. [8] This research suggests an automated irrigation system that automatically waters plants while monitoring and preserving the desired soil moisture content. The control unit is implemented using the ATMEGA328P microcontroller on the Arduino Uno platform. The system makes use of soil moisture sensors to determine the precise moisture con- tent of the soil. This value enables the system to avoid over- or under-irrigation by using the proper amount of water. IOT is utilized to inform farmers about the condi- tion of their sprinklers. A GSM-GPRS SIM900A modem is used to update a webpage with data from the sensors, so that farmer may check whether the water sprinklers are ON or OFF at any particular moment. Additionally, the sensor readings are sent to a Thing Talk channel where they are used to create graphs for analysis.

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3 Circuit Diagram

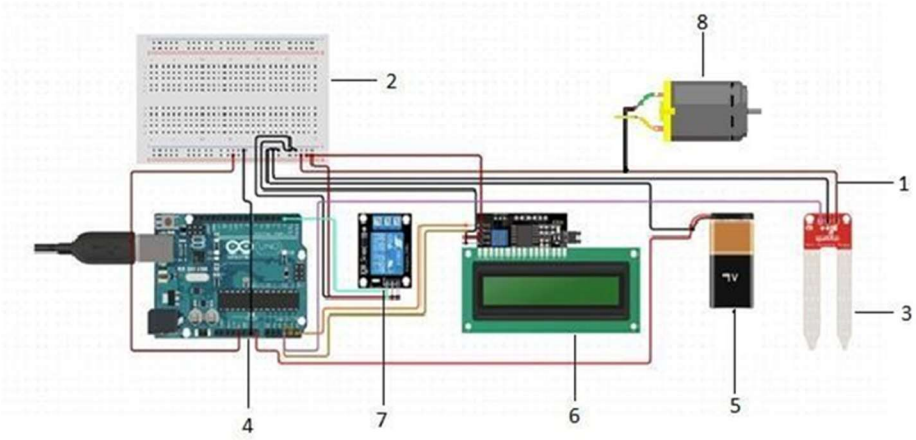

Fig. 1. Circuit diagram of automated drip irrigation system

The Components that are used in this project are:

1. Jumper Wires
2. Breadboard
3. Moisture Sensor
4. Arduino Uno
5. Battery
6. LCD display
7. 5v relay module
8. Motor pump

4 Proposed System

Irrigation can be automated by using sensors, microcontroller. The low-cost soil mois- ture sensor continuously monitors the field and is connected to the microcontroller (Arduino Uno)[5]. The microcontroller is provided with 5 volts of power. The Ar- duino instructs the relay to switch ON the motor if the soil moisture content drops below a specific level, which is determined by the threshold value provided in the Arduino code. The motor won't turn off until the soil moisture reaches the necessary threshold. The motor will automatically shut off when the soil moisture reaches the necessary level.

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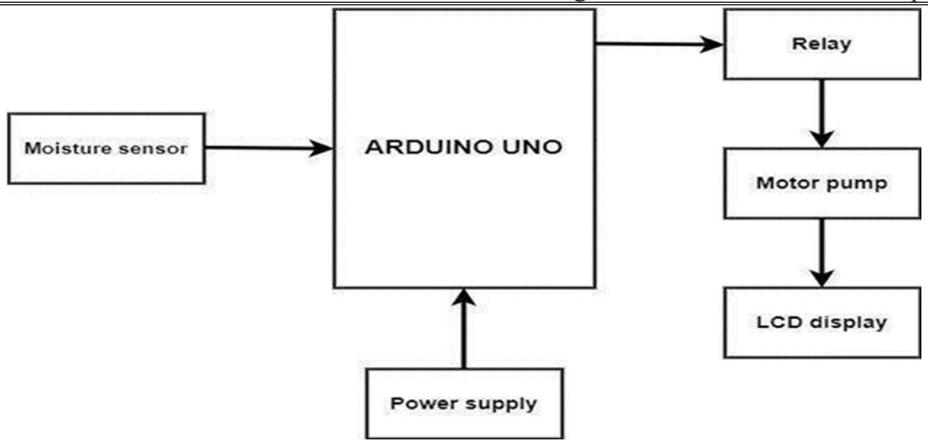

Fig. 2. Block diagram

4.1 Algorithm

Step 1: Soil moisture sensor senses the moisture level of the soil.
Step 2: If the moisture sensed value is greater than the fixed threshold value then noneed to switch on the motor.
Step 3: If the Moisture level is less than the threshold value, then the water motor isswitched on automatically.
Step 4: The moisture level returns to its initial state (turns off the water motor) once itreaches the threshold value.
Step 5: End the process.

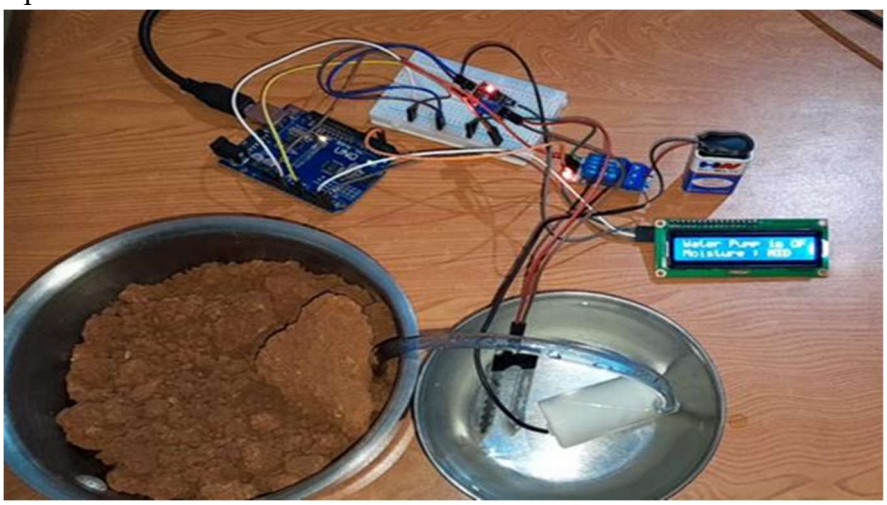
Fig. 3. Smart Irrigation System Using IOT

5 AR Implementation

Augmented reality is useful in drip irrigation. This technology provides real-time information and visual overlays that can assist farmers and irrigation specialists in various ways. A protocol is proposed using augmented reality in unity software, where visualization of the model is seen. AR can assist in visualizing the impact of drip irrigation on crop growth. By superimposing data, such

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as soil moisture levels or nutrient distribution, onto the actual plants in the field, farmers can better understand how their irrigation practices are affecting crop health and adjust accordingly. The integration of AR technology into automated drip irrigation systems has the potential to bring significant improvement to the agriculture industry. Forest environment is created using terrain and assets are added by downloading the assets from asset store and other websites. Implementing different functions like keyboard event, mouse event and animations are added. In the middle of the forest, a farm is placed contain- ing crops and two buttons are added. If moisture high is clicked, then the water flows to the field from pipes which are connected from the pond.

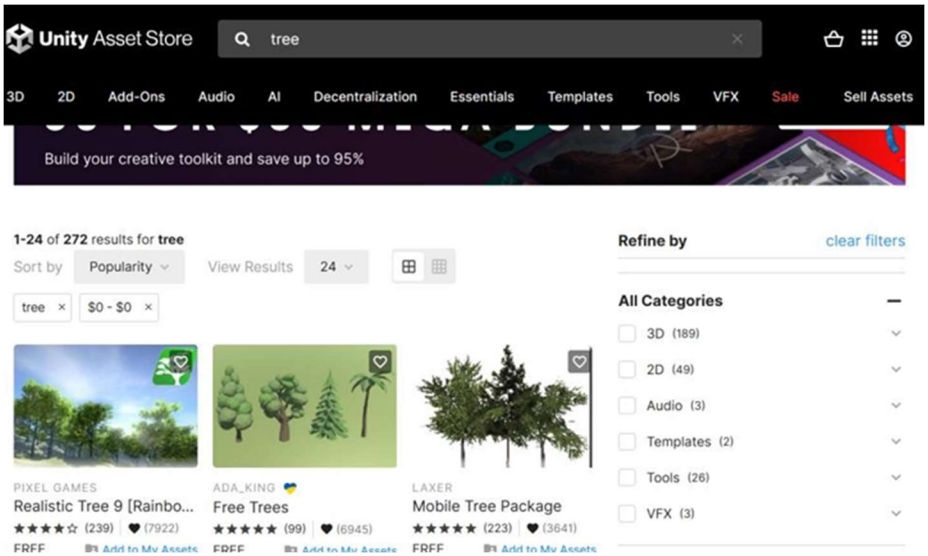

Fig. 4. Unity asset store

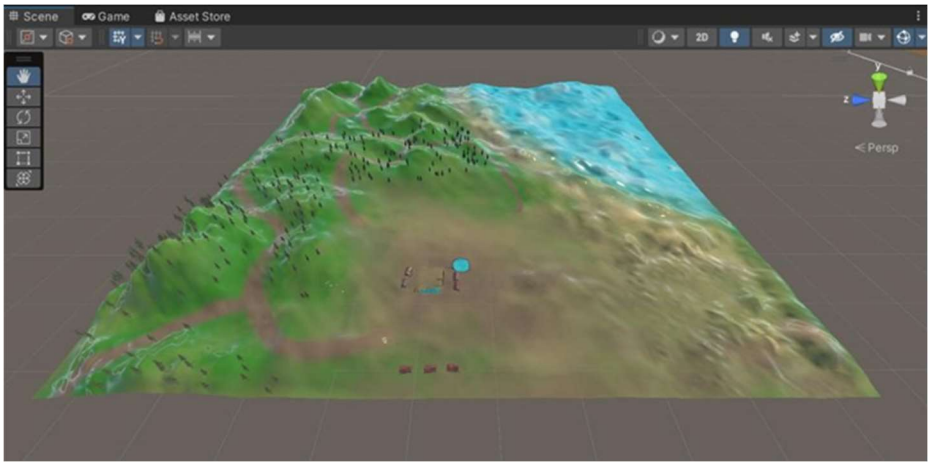

Fig. 5. Prototype of Automated drip irrigation

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Fig. 6. AR Prototype indicating soil moisture level = “Moisture LOW”

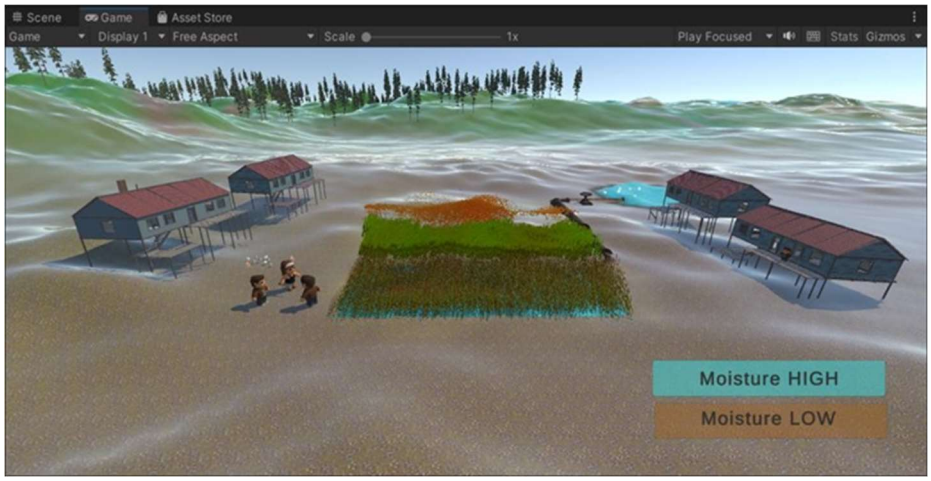

Fig. 7. AR Prototype indicating soil moisture level = “Moisture HIGH”

6 Conclusion

The Internet of Things and augmented reality were used to successfully develop and install a smart irrigation system. The automated irrigation system implemented was found to be feasible and economical for maximizing water resources for agricultural productivity. The irrigation system benefits the farmer by enabling more efficient operations. Water conservation techniques for irrigation must be efficient and cost- effective as water demand rises and aquatic habitats must be safeguarded. This tech- nology significantly lowers the amount of water used. It requires very little upkeep.

Power usage has significantly decreased. Crop wastage significantly decreases while crop productivity rises.

7 Future Enhancement

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AR/VR can be used to create a virtual representation of the irrigation system, allow- ing farmers to monitor and control it remotely. This can be especially useful in large- scale farming operations, where it can be difficult to physically inspect every inch of the system. The present system can be added with other sensors to perform different features.

From a future perspective, this system might be the more intelligent one that antic- ipates user behavior, plant nutrition levels, and harvest times. The use of machine learning algorithms will allow for future breakthroughs that will greatly benefit farmers and minimize water use in agriculture.

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