SMART AGRICULTURE SYSTEM USING NANOGRID

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ABSTRACT:

India is mostly an agrarian nation. For the vast majority of Indians, agriculture is their primary source of income. It contributes significantly to the development of the farming country. Cultivation accounts for around 16 percent of India's overall GDP and 10% of its exports. Water is a vital resource for agriculture. Irrigation is one method of supplying water, although there will be some water surplus in some circumstances. As a result, we have developed a project termed autonomous watering system utilising IoT in order to save water and time. We are employing several sensors in our proposed system, such as temperature, humidity and soil moisture sensors, which sense the various limits of the soil and produce on soil moisture value land that is watered by ON/OFF of the motor. The user's android application will show the sensed constraints and motor status. To create a nano grid, we use solar module to get the maximum power. The system is controlled by solar energy. The system includes a sensor that continually monitors the water content and sends signals to the microcontroller to switch on and off the motor. The LDR sensor can detect and notify the field owner of unwanted access into the field.

Keywords: *Smart irrigation, Nano grid, Soil moisture sensor, DC motor, Water level sensor, temperature sensor, Solar Module, Motor driver, servo motor*

1. INTRODUCTION

Agriculture is the main source of income for the majority of India's population and a big contribution to the country's economy. However, in India's agriculture industry, technology participation and usability must to be developed and nurtured. Although the Indian government has used some ingenuity in providing internet and mobile messaging services to ranchers in relation to agricultural queries and agricultural vendor information. According to the report, agriculture provides 27 percent of GDP and employs 70 percent of India's people.

Agriculture is being transformed by the Internet of Things, which is helping farmers to overcome great hurdles. While meeting the believe that promoting demands of a population of the world, agriculture must manage growing water limitations and restricted land availability. New creative IoT applications that increase the quality, quantity, safety, and cost benefits of agricultural produce are addressing these challenges. [1]

Agriculture is the backbone of India's economy. Agricultural is now becoming increasingly important to meet the needs of the human race in today's world, as the world's largest population continues to grow at an exponential rate. Agriculture, but at the other hand, requires irrigation, and because we use more water every year than we get in rainwater, producers must develop ways to save water while still getting the highest output. Farmers, on either hand, have been using manual irrigation canals to water the field at frequent intervals since the dawn of time.

According to research, agricultural emissions 85 percent of natural water sources worldwide, and this proportion will continue to go up as the world's population grows and food demand rises. It is critical to develop

water-use plans based on science and technology, including technical, agronomic, managerial, and institutional advances.

Agricultural irrigation is guided by crop water need criteria using Internet technologies. We have the ability to reduce water waste and maximise scientific technologies in irrigation methods by utilising Internet and sensor network technology. As a result, it has the potential to significantly improve water use and productivity.

The Internet of Things (IoT) is a technology that enables a mobile phone to track the functioning of a device. The Iot technology is engaged with connecting communication devices that are placed in a variety of places, some of which are far away. The Internet of Things is a networking standard that collects information from a multitude of sensors and enables anything to access the internet to share information.

It could also be used to modify the state of the device. The central processing unit will incorporate a communications system that will receive information from various sensors and transfer it to the mobile screen. A higher data transmission device, including a Wi-Fi module, will be used to do this. The data from the main unit is transformed into usable information and transmitted to the user. The data may be seen using a portable device such as a mobile phone or even a tablet. Farmers are concerned about water shortages these times. To create a nano grid, we use solar module to get the maximum power.

The suggested method is designed to limit the quantity of water that flows needlessly into agricultural areas. Temperature, moisture, and humidity sensors are used to continually monitor and send data to the supplied IP address. The Application software regularly collects data from the assigned IP address. The motor is operated by the relay, which is attached to the Node MCU, when the soil moisture exceeds the predefined limit. The Android application is a simple menu-driven app with four options. This provides details about just the motor, as well as humidity, temperature, and moisture content. The motor status displays the current state of the pump.

2. PROBLEM STATEMENT

Many individuals forget to water their plants throughout their daily duties, making it a difficult effort to keep their plants strong and healthy. To eliminate these issues and increase plant development, an automatic watering system has been designed. As a result, our project aims to develop a smart irrigation system for watering the plants while also informing the user via a message. This project also informs users about current water level in the tank as well as the soil moisture content. This project also aids in determining the environment's temperature and humidity.

3. PROPOSED SYSTEM

Smart irrigation system is developed by using the Microcontroller i.e., NodeMCU and to get the power we use Solar module and it plays a main role in this automated system. The sensors like soil moisture sensor, water level sensor, temperature sensors are connected to the NodeMCU microcontroller. The output of the sensors are fed into the NodeMCU.

On receiving the signal from those sensors, the microcontroller gives the appropriate output that turns on the motor driver according to the soil and the atmospheric conditions and operates the water pump. This soil moisture sensor determines the soil condition and it is expressed in the term of voltage. Then it compares the output voltage with the reference voltage. If the reference voltage is higher than the soil condition expressed in voltage, then the pump gets turned ON and the agriculture land is been irrigated automatically by the signal which is been provided by the relay. In the vice versa condition, the relay does not operate, the pump remains in the OFF condition.

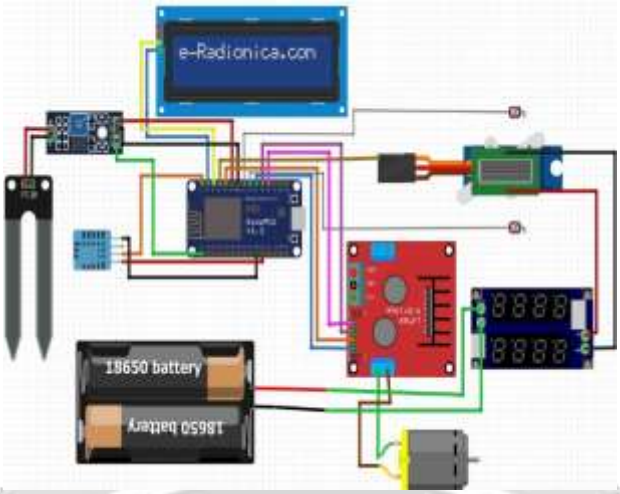

Fig.No:1 Block Diagram

The Microcontroller receives an analog signal from of the soil moisture sensor, which it converts to a digital signal. The microcontroller has already completed the program, and the signal has been sent to the relay. The motor is switched on or off based on the signal sent to the motor driver circuit.

When the temperature goes under freezing, the soil becomes moist, as well as the voltage exceeds the reference voltage, the microcontroller receives a low signal ["logic 0,"] forcing the motor to turn off and stop water pumped. The voltage is taken from the sensor's internal comparator. When the sensor is placed in the field, there will be conductivity. Because water is an efficient conductor of electricity, it is necessary for good conduction to occur.

The signals are passed, and the relevant signals switch the motor off. If there is no conduction, it implies that there is no water content, thus the motor is turned on by the NodeMCU essential signals. When the signal to switch on the motor is transmitted, Water pumped to a plant once the motor driver is turned as well as the motor is linked to the circuit. Similarly, if the controller output is to shut off from the motor, then relay switch is activated, and then motor is not supplied with power, resulting in the motors being switched off. As a result, the appropriate water is delivered to the plants while they're in need, as directed by the Arduino software. It is not necessary to monitor this area on a regular basis.

Pump: A pump is a component which consists of a motor which convert the electrical energy to mechanical energy. The rotational movement increases the pressure of the water in the tank or well. Science the pressure is high it takes the water from the well and it is used in agriculture land.

NodeMCU: NodeMCU plays a key role in this irrigation system. The output of all the sensor has been provided as the analog input to the NodeMCU. This microcontroller convert analog input to digital output. These digital output signals are connected to Motor driver. These digital outputs are generated from the programme which is already burned in the Microcontroller.

Fig.No :2 NodeMCU

Fig No.3 describe the soil moisture sensor. The moisture content in the soil is detected by the soil moisture sensor. The resistance functions as the basis for this moisture level sensor. If the resistance number is low, this indicates that there is a lot of moisture in the soil. When resistance is strong, it indicates that the earth is dry. This signal is sent to the microcontroller, which then activates the relay.

Fig.No:3 Soil Moisture Sensor

Fig.No:3 Determine the total water content of the soil by utilising another feature of the soil as a proxy for the moisture content, such as resistance value, dielectric constant, or neutron interaction. The relationship between the number of major with moisture levels must be calibrated, and it might change based on environmental conditions including soil type, temperature, and electric conductivity.

Fig No:4 detects the levels of water in the tank. To determine water level, a sensing element is inserted in the tank. The sensor is provided the reference value as the minimum needed level. When the water level falls below the base value, the user is informed about the water level.

Fig.No:4 Water Level Sensor

Fig No:5 Describe the temperature sensor and Humidity sensor. These sensors would notify a mobile device if the level of water is over or below the stated value. Optical concepts are used to control the electric water tank. Because of its benefits, such as high sensitivity and the lack of machine elements, it is employed in current applications. The resistance to corrosion detector is simple to install and can tolerate extreme pressure and heat.

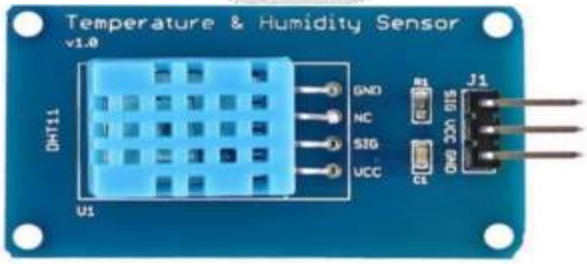

Fig.No:5 Temperature and Humidity Sensor

Fig No:5 is a low-cost sensor can detect changes in the environment to monitor both temperature and moisture. It runs on 3.3 to 5.5 volts. The humidity is measured in percentages ranging from 20% to 90%. The average temp is 0 to 50 degrees Celsius. There are three pins on the temperature and humidity sensor. It features a connection port, as well as power grounding and supplying pins.

Solar Module: A solar panel is an assembly of photovoltaic cells that uses sunlight to generate electricity. These cells are arranged in a framework that's designed to allow them to be installed. A collection of photovoltaic modules is referred to as a PV panel, and an array is a type of system that uses solar electricity.

Fig.No:6 Solar Module

Motor Driver: The L298N Driver Module is a high-overall performance motor driving force for DC and Servomotors. An L298N driver circuit IC or a 78M05, 5-volt regulator make up this module. Up to four DC motors can be controlled by the L298N Module, or two DC motors with direction and speed control.

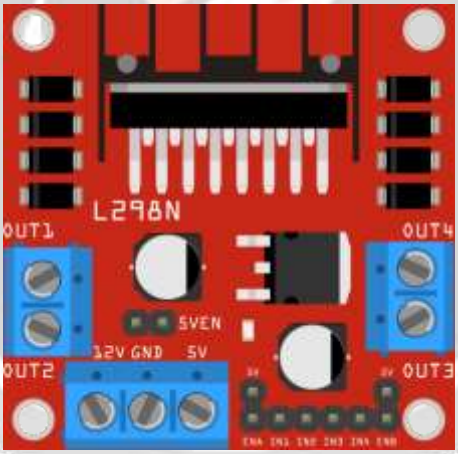

Fig.No:7 Motor Driver

LCD Display: It is a type of electronic display module that is utilised in a wide range of circuits and devices like smartphones, calculators, computers, television sets, and so on. Inter led diodes and seven sections are the most common applications for these displays. The primary advantages of utilising this module are its low cost, ease of programming, animations, and the fact that there are no restrictions on displaying different characteristics, special or even animations etc.

Fig.No:8 LCD Display

4. CASE STUDY

The study looked at a number of moistures in the soil sensors. Sensors necessary for the lane's procedure system of water supply the sort of moisture has a big impact on this. we have a sensor for. The new technology has enabled the Moisture is monitored from 6 inches to 48 inches in depth, but just at 12, 24, 36 inches in other cases. Depending on the manufacturing company, the number of sensors utilised may vary. The moisture in the soil sensor is made up of two probes, each measuring about 3 inches broad and 4 inches long. In sugarcane cultivation, a progressive farmer in a community implemented a completely automated irrigation system. His plantation is in the Karur region, and he lives in Chennai. He oversees the agricultural operations using pre-scheduled text messages on his phone. The entire block is powered by a backup generator that runs 24 hours a day, seven days a week. Consider a banana plant: its entire water need over the course of its lifetime is around 900-1200mm, which may be met by either rainfall or an automatic irrigation facility. Irrigation of banana plants is advised each 3-4 days during the summer season and every 7-8 days during the winter season. As a result, irrigation is dependent on the kind of soil, crops, and weather conditions.

5. RESULT AND DISCUSSION

In agricultural fields, a proper irrigation system is used. The water sensor is placed in the soil and provides an analogue signal to the Arduino, as well as analogue signal from the water level sensor, temperature sensor, and humidity sensor. The motor is switched on once the analogue impulses are translated to digital signals. The user receives the message signals as a message, and the common expression whether the motor is switched on or off.

Fig.No: 6 Experimental setup

6. CONCLUSION

Farmers, in particular, are having severe difficulties watering their agricultural fields these days since they have no clue when the electricity will be available to pump water. They must wait until the land is properly watered even after that, which forces them to abandon other pursuits. Here's a concept that benefits not just farmers but also gardeners by sensing soil moisture and immediately switching on the pump when the electricity is turned on. By building a system for monitoring moisture level of soil, the project provided an opportunity to assess current technologies, and also their merits and drawbacks.

By switching on and off the sprinklers based on soil humidity levels, the proposed technology might be utilised to simplify one of the most moment tasks in farming: irrigation. Agricultural production is among the industries that uses the most water. The technology uses data from soil water sensors to water the soil, reducing up or down irrigation and crop damage. The farmer can keep records of the process using a website. This study suggests that the use of IoT and automation in agriculture can lead to major improvements. The technology might be a feasible answer to the problems associated with the present manual and inefficient agriculture system by allowing for even more effective resource utilization.

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