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Internet of Things (IOT) Based Pumping Set Irrigation System – Smart Farming

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Internet of Things (IOT) Based Pumping Set Irrigation System – Smart Farming

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Abstract- Approximately 70% of India's population depends on agriculture, and one third of the nation's capital is generated by the industry. Agricultural issues have always hindered the development of the country. A solution to this problem is smart agriculture, which is achieved by modernizing the current traditional methods of agriculture. So the project aims to make agriculture smart through automation and Internet of Things. Water availability is monitored in automation systems through sensors, and crop watering is accordingly controlled through controlled irrigation. The proposed Irrigation system implements IoT, so that all the information received from the sensors and the various parameters are fed directly into the microcontroller. In the microcontroller, a pre-set value for soil moisture sensor is configured. When the threshold value for soil moisture sensor is exceeded, water is automatically applied to the crops, and as soon as the amount of water required is met, irrigation stops. This information is then sent over the internet through a Wi-Fi module attached to the microcontroller. This enhances automated irrigation, as the pump can be turned on or off based on the information given by the controller. With this application, the water system for the agricultural field is controlled precisely by sensors and microcontrollers. With this method, various parameters related to a field can be measured automatically without using manpower, improving the irrigation process.

Keywords – Internet of Things (IoT), Smart Farming, Irrigation.

I. INTRODUCTION:

Agriculture was a key development on the rise of the sedentary human civilization. The growth of the agricultural sector is necessary for the development of a country's economy. Most irrigation systems in India are physically regulated, leading to major water losses. Currently, 83% of the total water consumption in the country goes to the agriculture sector. With population growth in the upcoming years, it is likely that this demand will increase. Therefore, to meet this demand, we need to adopt new techniques that can conserve water for irrigation. With population growth in the upcoming years, it is likely that this demand will increase. Therefore, to meet this demand, we need to adopt new techniques that can conserve water for irrigation. Technology developments and the availability of cheaper and more effective solutions have improved the efficiency of irrigation and reduced water loss. In particular, Internet of things (IoT) devices are being utilized in various fields. Pump sets are relatively new innovations in agriculture. With the help of a smart phone, you can connect the pump to water and land sensors to determine when it's time for irrigation. The best thing about this equipment is that it allows you to turn off your hose without having to touch it- which means more time saved and less water wasted. In order for any farming business to be sustainable, they need to conserve their resources. In order for this invention to work, you'll need a way to monitor how much water is being used, which will help you plan the next irrigation cycle accordingly.

Applicability of IoT in Agriculture:

In smart farming, connected devices and innovative technologies are incorporated together into agriculture to do agriculture and grow food sustainably. It is an approach to farming that utilizes high-tech and effective methods. A major part of Smart Farming relies on IoT, eliminating the need of physical labour for farmers and growers, and thereby increasing productivity in every possible way. The recent agriculture trends relying on agriculture have brought benefits such as efficient use of water, input optimization and more thanks to the Internet of Things. A smart farm based on IoT improves agriculture by monitoring the field in real-time, leading to huge benefits that have revolutionized agriculture in the recent years. Sensors and interconnection have helped the Internet of Things in Agriculture, not only save farmers' time but also reduce resource consumption, such as water and electricity. It monitors factors such as humidity, temperature, soil, etc. and provides a clear, real-time observation.

II. PROPOSED SYSTEM

The artificial method of watering crops in farms is irrigation. In the current scenario, water shortage due to increased exploitation has urged to develop a new technology which can save water from wasting and since agriculture is the most cost-effective business, therefore there will be a smart way to check the loss of water in the irrigation system. [4]

Since India is an agriculture-based country with plenty of water resources, population growth and over-exploitation have resulted in a condition where the supply of water exceeds the demand. Smart irrigation systems have sensors that provide farmer with updates about their land such as soil moisture sensors, water flow sensors, temperature sensors, and humidity sensors to determine how much water is required. The soil moisture sensor measures the moisture content of the soil in the field to protect crops from water desertification problems, and the temperature sensor measures the temperature of the crops since they are sensitive to changes in temperature.

The proposed system is designed to use smart sensors with IOT to make agriculture a smarter one, by collecting and analysing data from multiple nodes throughout the field. The basic objective of the project is to gather and process data from multiple nodes throughout the field. The farmers will be able to control the operations remotely through a mobile application.

It is designed to centralize monitoring and control of agriculture land from anywhere using a mobile device. The system can be managed and operated wirelessly from anywhere. The application user can control basic operations of collection of environmental, soil, fertilization, and irrigation data; automatically correlate such data and filter -out invalid data from the perspective of assessing crop performance; and compute crop forecasts and personalized crop recommendations for any particular farm using the application.

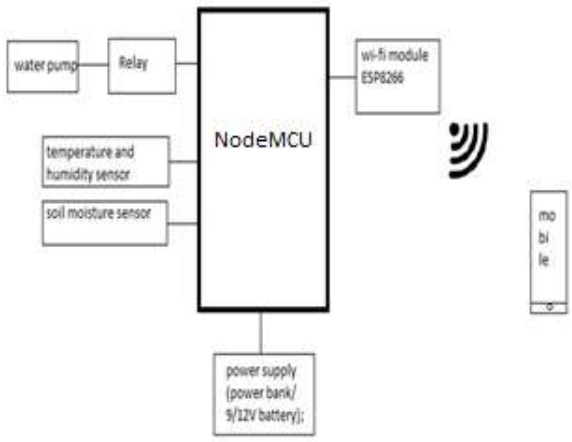


Figure 1. Block Diagram of Smart irrigation system

The sensor network will provide information about the climatic conditions of the farm such as soil moisture, temperature, and humidity. With the help of this, the system will decide the operation on the field. A system that can be operated from a distance, this can allow farmers to monitor and control their fields

24x7 throughout the year. NodeMCU has a microcontroller that controls the entire setup and an ESP8266wifi module is used to transmit and receive data.

III. SYSTEM DESCRIPTION

(A) NODEMCU

NodeMCU is an open source firmware for which open source prototyping board designs are available. The name "NodeMCU" combines "node" and "MCU" (micro-controller unit).[15] The term "NodeMCU" strictly speaking refers to the firmware rather than the associated development kits.

Both the firmware and prototyping board designs are open source.[15]

(B) SOIL MOISTURE SENSOR YL-69

Soil moisture sensor measures the water content in soil. It uses the property of the electrical resistance of the soil. The relationship among the measured property and soil moisture is calibrated and it may vary depending on environmental factors such as temperature, soil type, or electric conductivity. Here, it is used to sense the moisture in field and transfer it to microcontroller in order to take controlling action of switching water pump ON/OFF. [16]

(C) WIFI MODULE-ESP8266

Wi-Fi Module ESP8266 is a self-contained SOC (System on Chip) with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network (the device can act as an access point for interconnection). [17]

(D) DHT11 SENSOR

The DHT11 is a low-cost digital temperature and humidity sensor with a single wire digital interface. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air and spits out a digital signal on the data pin (no analog input pins needed). The sensor is calibrated and doesn't require extra components so you can get the right to measuring relative humidity and temperature. [18]

(E) RELAY MODULE

This is a 5V single Channel Relay Board Module for NodeMCU. It can be used for microcontroller development board module or home appliance control.

(F) MINI SUBMERSIBLE WATER PUMP

This DC 3-6 V Mini Submersible Water Pump is a low cost, small size Submersible Pump Motor which can be operated from a 2.5 to 6V power supply. It can take up to 120 liters per hour with a very low current consumption of 220mA. Just connect tube pipe to the motor outlet, submerge it in water, and power it.

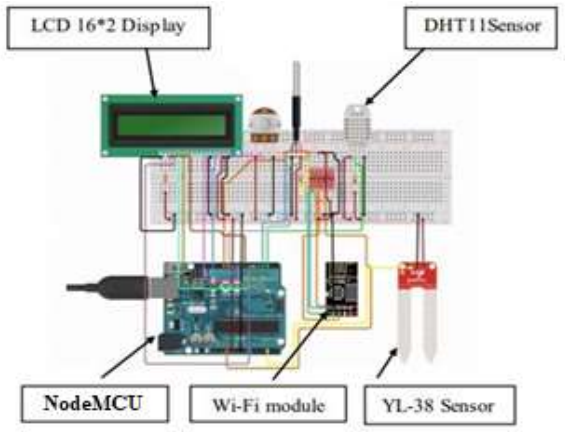
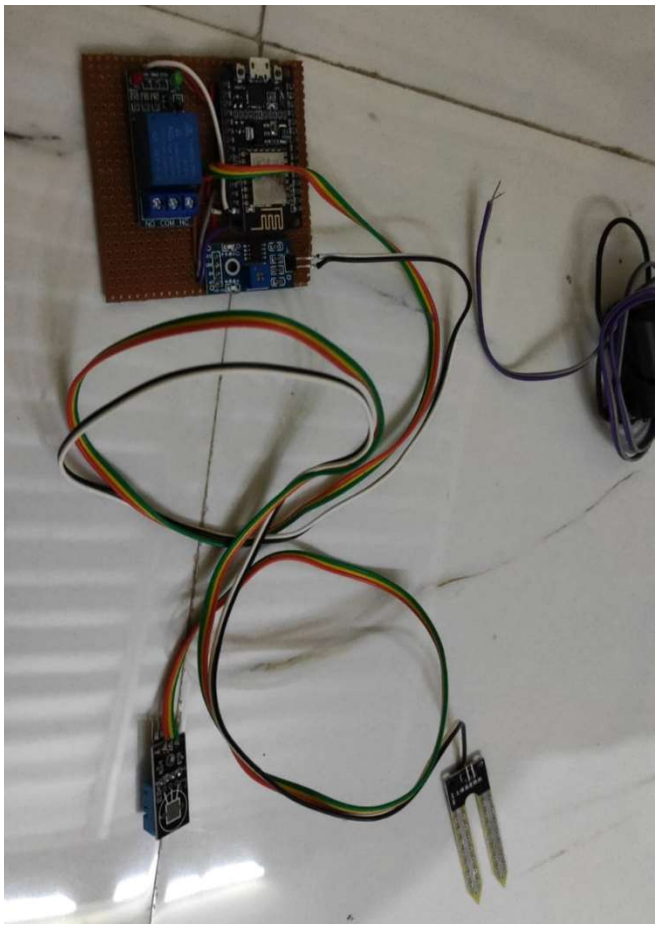


Figure 2. Circuit Design



IV. CONCLUSION

With the technologies of IOT, agriculture can be made more efficient and more accurate. Water is the most important thing a person needs and is very important for agriculture. Water wastage due to poor irrigation system, or in efficient methods will cost us a lot in the future.

The proposed system automates the whole process of irrigation, which is a huge time-consuming process. Thus saving, time money and water wastage too. From this project it can be concluded that there can be huge development in agriculture with the help of IOT platform. Thus, it can be said that this system is a potential solution of the problems faced by the farmers in manual execution of the irrigation process and thus utilizing the water resources to their best.

V. ACKNOWLEDGEMENT

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