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Implementation of IoT Technology in Automation of Irrigation System

BhavaniG[1], Harini P[2] , AbinayaA[3] , Sheriff M[4]
[1,2,3]II yr Student/ Department of ECE &[4]Assistant Professor/ Department of ECE,
Vel Tech High Tech DrRangarajanDrSakunthala Engineering College, Chennai, India

Abstract:- The key sector which is ruling the world is sustainable agriculture, where irrigation plays a major role in agriculture. In this project we implement an automation of irrigation through detecting the temperature, humidity of air, rain drop, light and by sensing the soil moisture in the ground. The moisture level in the soil is detected, when the moisture level is low then the soil is irrigated through water pump. If the moisture level is high then the irrigation through water pump is stoped. To indicate this precise irrigation to the land owner we use blynk app, an IOT platform. Through this IOT platform we can monitor the irrigation level of the soil. We can observe the temperature, humidity, rain drop and light in the farming land through blynk app from any part of the world. This experimental technology has a major development in sustainable agriculture.

Keyword:- Automation irrigation, IOT platform, weather detecting, moisture detecting, sustainable agriculture.

I. INTRODUCTION

Agriculture is an important sector that contributes to the economic prosperity of the developed nations and plays an active role in the economy of the developing countries as well. The per-capita income of the rural population has significantly increased as a result of the expansion of agriculture. So, it makes sense and sense to put more attention on the agriculture industry. The Internet of Things (IoT) has become an integral part of day-to-day life, transforming how we interact with technology and the world around us. As technology continues to advance, IoT applications are expected to expand further, making our lives more interconnected and convenient. The basic concept of the Internet of Things (IoT) is connecting everyday objects to the internet and enabling them to communicate with each other and with us. It involves adding sensors, actuators, and connectivity to ordinary objects, turning them into smart devices.The agriculture sector has been undergoing a massive change due to technological advancements. One of the critical areas where technology has made a significant impact is the automation of the irrigation system. Irrigation is vital for the agricultural sector as it enhances crop yields and increases crop quality. Irrigation is the process of providing water to crops to ensure their optimal growth and productivity. The IoT-based automation of the irrigation system includes various sensors such as soil moisture sensors, weather sensors, and water flow sensors, which are placed in the field to collect data. This data is transmitted to a central control system that analyzes it and sends commands to the irrigation system, turning on or off the water supply based on the information received. This ensures that the crops receive the right amount of water at the right time, which can result in better yields and reduced water waste.Overall, the automation of irrigation systems using IoT technology is a promising development for the agricultural industry. By using IoT, farmers can optimize water usage, save time, increase crop yields and can monitor the irrigation system in the agriculture field through PC or mobile, which can result in a more sustainable and profitable agricultural operation.

II. RELATED WORKS

The concept of automation of irrigation is researched in the following paper. TanhaTalaviya [1], her research paper aims to examine the diverse applications of AI in agriculture, such as sensor-based irrigation, robotic and drone-assisted weeding, and spraying. These technologies help reduce water and pesticide usage, maintain soil fertility, optimize manpower utilization, enhance productivity, and improve overall quality. By surveying the work of numerous researchers, this paper provides a concise overview of the current implementation of automation in agriculture, particularly focusing on weeding systems carried out by robots and drones. It discusses various methods for soil moisture sensing and presents two automated weeding techniques. ArtiChungade [2], is using IoT based system, Moisture level is sense in the soil, depending upon the threshold level water provided to the crops. Sense values store to the cloud. Using that dataThis system is solution to the crises that occur due to uneven use of water. Moisture sensor will sense the moisture level with threshold value if the moisture level is below the threshold value then it will send signal to Arduino and also the data is stored to the cloud. It will automatically turn motor ON It will supply required water to the crop .If moisture in the soil is above threshold level then automatically Water pump motor will turn OFF. Ravikumarjalli [3] extended their paper by using various sensors and weather stations to collect real-time data on weather conditions, such as temperature, humidity, wind speed, and precipitation. This system can also be integrated with various technologies, such as soil moisture sensors, weather forecasting tools, and crop yield monitoring tools, to enhance the efficiency and accuracy of irrigation practices. PavankumarNaik [4], In this, the purpose of an author is to develop an automated irrigation system, which will turns ON/OFF the pumping motor depending upon the dampness content of the soil. In the circuit, sensing arrangement contains op-amp IC LM 358, microcontroller 8051, two stiffer copper wires , this sensing arrangement senses the dry condition then the relay driver IC receive command from microcontroller 8051

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regarding Switching ON the motor and when the soil to be get wet then the motor will switch off. In this system, less manpower is required. Water conservation takes place because water is directly transferred to the roots. The drawback of the system , if the system need excess water in any specific area then it will not possible using this system. MuktiNtahGogoi [5], implemented automation irrigation system by collecting the data of moisture level in the field through soil moisture sensor and the water level in tank through indicator. Then sends the data to Arduino after that it sends measurements to the appilication using Node MCU. To ensure efficient irrigation, we employed a soil moisture sensor device to monitor the moisture level in the soil. Additionally, a water level circuit was utilized to detect the water level in the tank, enabling the automatic control of the water pump based on varying conditions such as soil moisture and water level. When the soil humidity is low (indicating dry soil), the water pump is activated, and when the humidity is high (indicating wet soil), the pump is deactivated. Furthermore, the water level sensor prevents the pump from running when the water level falls below a certain threshold, regardless of the soil condition, thereby preventing dry running of the pump. From learning these papers we have implemented some sensors to our project for making the device more efficient.

III. METHODOLOGY

The motive of this project is to give a complete automation system which sense all the parameters given to it and work according to the real time .

The initial step is to sense the humidity, temperature, moisture content,raindrop and light through the DTHT sensor ,moisture sensor ,raindrop sensor and light sensor respectively. The levelof these parameters is assigned in the programming code . According to that the sensorssend the datas to the Node MCU (Fig.1), which is a micro controller.

Fig. 1: NODE MCU

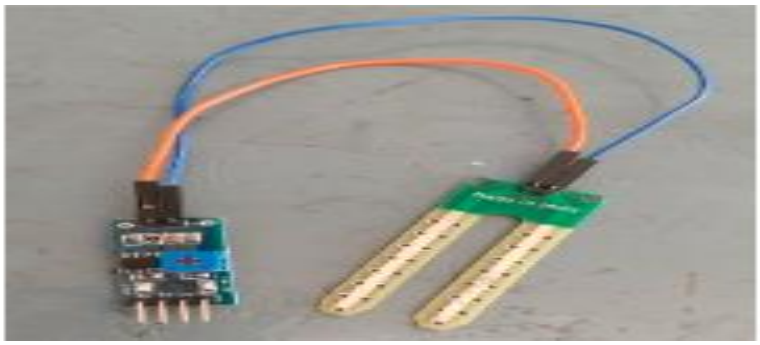

Fig. 2: Soil moisture Sensor

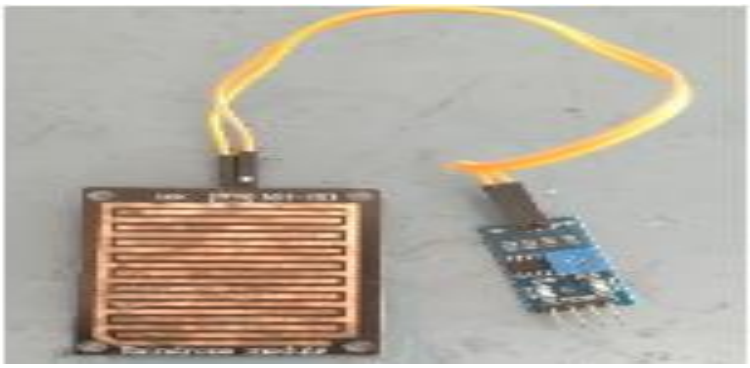

Fig. 3: Rain drop sensor

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Fig. 4: DTHT sensor

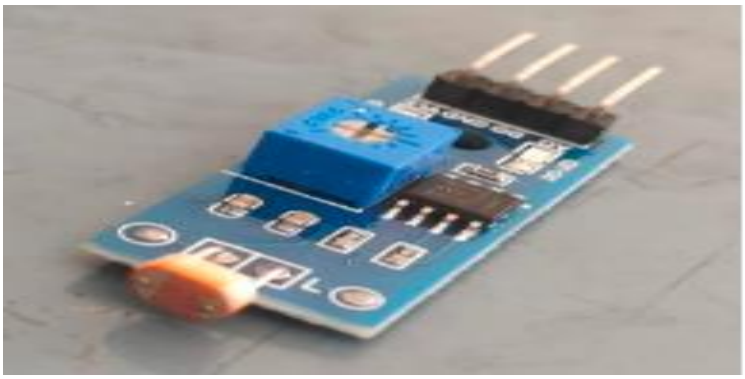

Fig. 5: Light sensor

The fig.2 is the soil moisture sensor which sense the moisture content in the soil . The moisture level is varied for different field's in agriculture. In this paper , we set the moisture level for paddy field . EX : The level of moisture is from 15% to 35% . This level is assigned in the code. Once the moisture level is sensed then the data is sent to the node MCU Which control the motor pump (i.e)if the data is greater , it turns OFF the motor pump , if the data is lesser then itturns ON the motor pump.

Accordingly, the DTHT Sensor (Fig.3) which sense Temperature and Humidity of the agriculture land. The Temperature and humidity value is set for paddy field that is temperature should be in 21 degree celsius to 37 degree celsius. This value is assigned in the code . Once the data is read by the DTHT sensor,Itsentto micro controller, that turns ON the motor pumpif the temperature is greater than the assigned value , it turns OFF if the temperature is lesser or equal to the assigned value.

The rain drop sensor (fig.4) and the light sensor (fig.5) is fixed to sense the climate (rainy) and thebrightnessintheland respectively . The light sensor sense the brightness and transfer the information to the controller (NODEMCU) . Likewise , the raindrop sensor sense the raindrop or sense the drop of water through the sensor plateand send data to the Node MCU .

Fig. 6: Relay module

The relay module (fig.6) is connected to the Node MCU which helps to turn ON and OFF the motor pump accordingly by the NODE MCU (microcontroller) .

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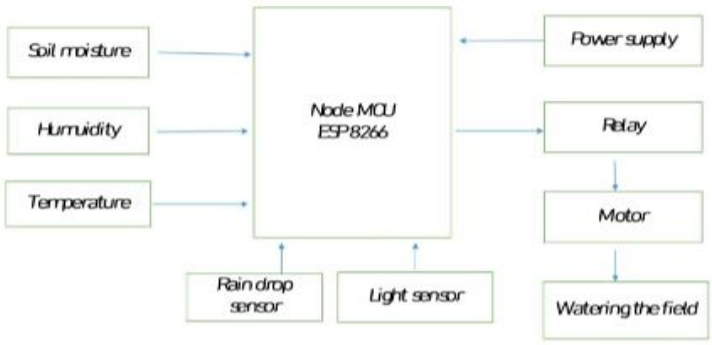

Fig. 7: Block diagram

In this project the automation of irrigation system is done through turning ON the motor pump another is turning OFF the motor pump.The block diagram (Fig.7) shows the working of this project. The soil moisture level, humidity, temperature, rain drop and light is sensed through the components such as soil moisture sensor, DHT11 sensor, rain drop sensor and light sensor. The sensed data is sent to Node MCU which plays a vital role in this project. According to the assigned parameters value ,if the moisture content is high and the temperature is low then the motor is turned OFF using relay module . If the moisture content is low and the temperature is high then the motor pump is turned ON through relay module to irrigate the land. This is the all over working of this Automation Irrigation System .

This ultimate working is monitored through the IOT platform, BLYNK app (fig.8). The Node MCU board is connected to the blynk app. Throughthat all the sensor working is monitored in the blynk app. The owner of the land or a farmer can monitor the agriculture land from any part of the world or place. We can also turn ON and OFF the motor pump by using this blynk app.

Fig. 8: BLYNK APP

The foremost irrigation system is done in automation process by sensing all the parameters .This project irrigates the land automatically without any human help and can also be monitored by the owner or farmer of the land from any part of the place.

IV. EXPERIMENT OUTPUT

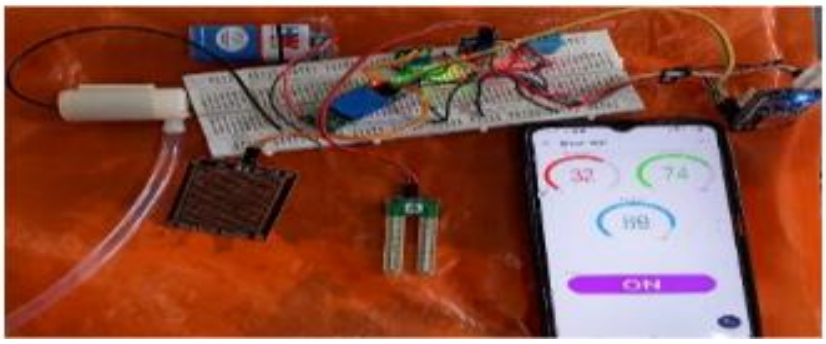

Fig. 9: EXPERIMENT OUTPUT

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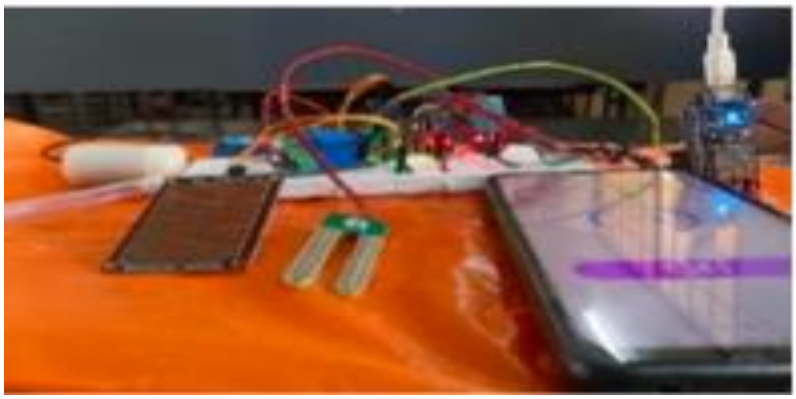

Fig. 10: EXPERIMENT OUTPUT

Fig. 11: EXPERIMENT OUTPUT

From the paper we have obtained the result as shown in the fig.9, fig.10 and fig.11. The result of the project is obtained by sensing the moisture level, humidity , temperature, raindrop and light with the respective sensors . According to the given code it will irrigate the land when the moisture content is low and the temperature is high then it stop irrigating when the moisture level is high and temperature is low.

Fig. 12: & Fig. 13: Blynk app monitoring

In the Fig.12 and Fig.13 it indicates the precise irrigation through Blynk app. It shows the soil moisture level, temperature and humidity level then the rain is indicated through notifications in this app. The irrigation system of the land is monitored through blynk app from any part of the place.

V. CONCLUSION

The automation of an irrigation system using IoT can provide many benefits, including increased efficiency, reduced water waste, and improved crop yield. By incorporating sensors and other IoT devices into an irrigation system, it is possible to monitor and control the system remotely, making it easier to manage water usage and ensure that crops receive the appropriate amount of water.

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Some of the key components of an IoT-based irrigation system may include soil moisture sensors, weather sensors, and actuators for controlling valves and pumps. These devices can be connected to a central control system, which can be accessed remotely through a mobile app. This allows farmers and other users to monitor the status of the irrigation system, adjust settings as needed, and receive alerts if there are any issues or anomalies.

Overall, an IoT-based irrigation system can provide significant benefits for farmers and other users, including increased efficiency, reduced costs, and improved sustainability.

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