IOT Based Smart Monitoring and Irrigation System

[1] Ankush Baran Basu, [2]Tanmay Bhakta, [3]Md.Sabir Ali, [4] Shubham Awasthi, [5]Puspak Pain

[1,2,3,4] Engineering Students, [5]Assistant Professor

[1,2,3,4,5] Dept. Of Electrical and Electronics Engineering

[1,2,3,4,5] Narula Institute of Technology

Abstract—

This paper proposes an automatic plant irrigation system by using INTERNET OF THINGS (IoT).The smart object inserted with sensors enables interaction with the physical and logical worlds according to the concept of Internet of Things (IoT). The system is embedded with a moisture sensor that checks the moisture level in the soil. After analysing the values, it provides an adequate amount of water to the crop. The pump automatically switches on and supplies water when the soil is dry. Similarly, when the soil is wet, the pump turns off, and no water is given to the crop. This irrigation system prevents excess water from flowing into the soil, thus reduces wastage of water, electricity and damage to the soil. The purpose is to focus on parameters such as temperature and soil moisture. This is a mobile integrated smart irrigation system using IOT based on application controlled monitoring system. The chief aim behind the design of this project is to control the water supply and monitor the crops through a smartphone.

Index Terms **– Agriculture, Moisture Sensor, Water sensor, Automatic, Internet of Things (IoT)**

I. INTRODUCTION

Agriculture is undoubtedly the largest livelihood provider in the world. In many countries, agriculture is the backbone of the country for its development, particularly the livelihood of the people and production of food materials and such as other raw materials [1]. Nearly 70% of the world's economy and people are is undoubtedly the largest livelihood dependent on agriculture. While most of the irrigation systems are controlled manually, smart irrigation system offers convenient, efficient and farmer-friendly irrigation facility [2]. Irrigation requirement depends on soil properties like moisture, temperature, water requirement and the type of crop which is grown in the soil. With the use of IoT and embedded systems, the factor like abundant use of water can be controlled, thus, helps in reducing the amount of water getting wasted. This paper establishes a system that helps to lessen the water wastage, automatic irrigation, best time complexity, and non-intervention of humans [3]. So, the automated irrigation system is needed because it is very simple and easy to control. This system provided the data according to the data and controls the water motor switch ON or OFF. Programming languages are used for automatic purposes. The moisture sensor, temperature sensors give a detailed analysis of the actual farm position. Another benefit of this smart irrigation system is that it gives an update of crops and warns the farmer before any kinds of unfavourable position on the farms.

II. LITERATURE REVIEW

Many researchers in this agriculture field doing research and found that the agriculture area and productivity are down day by day .So, researcher using different technology to the agriculture field and possible to increase the production and reduce the water wastage for irrigation.

R.Suresh et al. (2014) doing research this type of project using an automatic microcontroller that is based on rain gun irrigation system. This irrigation only takes place where the water is required so, large quantity of waters are saved. These systems are developed using android device for operating system and java programming language are used for develop the android platform applications. These systems are around lower range of agriculture field [4].

In the paper discuses wireless sensor network for monitoring the soil moisture level, temperature and humidity values. These data is sent to the system and the node is increased by using sleep-wake up plan. The system in this paper implements clustering of nodes. Graphical user interface (GUI) is designed in MATLAB software for data handling [5].

Ravi Kishore Kodali and Borade Samar Sarjerao present make the Low Cost Smart Irrigation System using MQTT protocol water pump based on soil moisture sensor for the agriculture field using Esp8266 NodeMCU- 12E.Esp8266 NodeMCU-12E uses a small size microcontroller. Transport Layer Security and Secure Socket Layer cryptographic protocols are provide system security. Soil moisture sensor is highly accurate, which is measures the value of soil moisture correctly [6].

The author has developed a project Carnegie Mellon University for plant nursery by creating a sensor/actuator network and a web-based GUI to view the real-time data collected [7].

Sonali D.Gainwar and Dinesh V.Rojatkar (2015) proposed a paper in which soil parameters such as pH, humidity, moisture and temperature are measured for getting high yield from soil. This system is fully automated, which turns the motor pump ON/OFF as per the level of moisture in the soil. The current field status is not intimated to the farmer [8].

Supraha Jadhv proposed automated irrigation system using wireless sensor network and raspberry pi that control the activities of drip irrigation system efficiently [9]

The author has discussed the benefits of using wireless sensor technologies and standards for wireless communications applied on wireless sensors in agriculture field over traditional mechanisms of irrigation by analysing the market growth [10].

III. PROPOSED SYSTEM:

The proposed automated irrigation and monitoring system consists of the Wi-Fi module, water pump, and soil moisture and temperature sensors. The smartphones module is used for communication. In the proposed work, crops or plants are considered along with their water requirement at different stages. After connecting the Wi-Fi module to the computer and smartphone, the system can be controlled from the phone whether the plants and crops need water, if yes then it can be controlled with just one tap on the smartphone. After watering if the moisture level is enough, then it would turn off automatically.

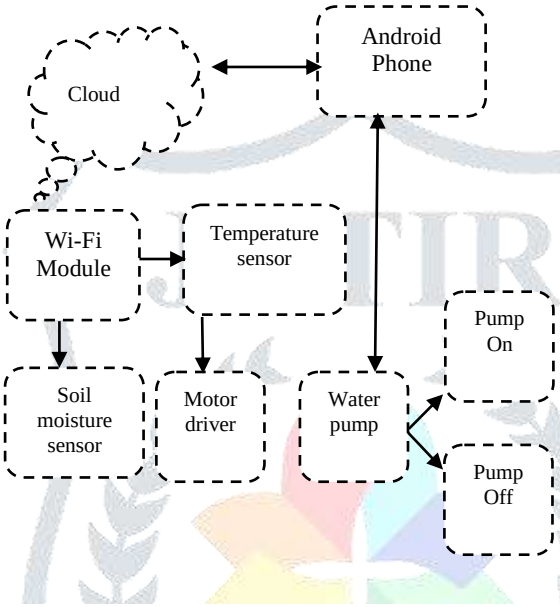

Fig1 Proposed Block Diagram of Irrigation System

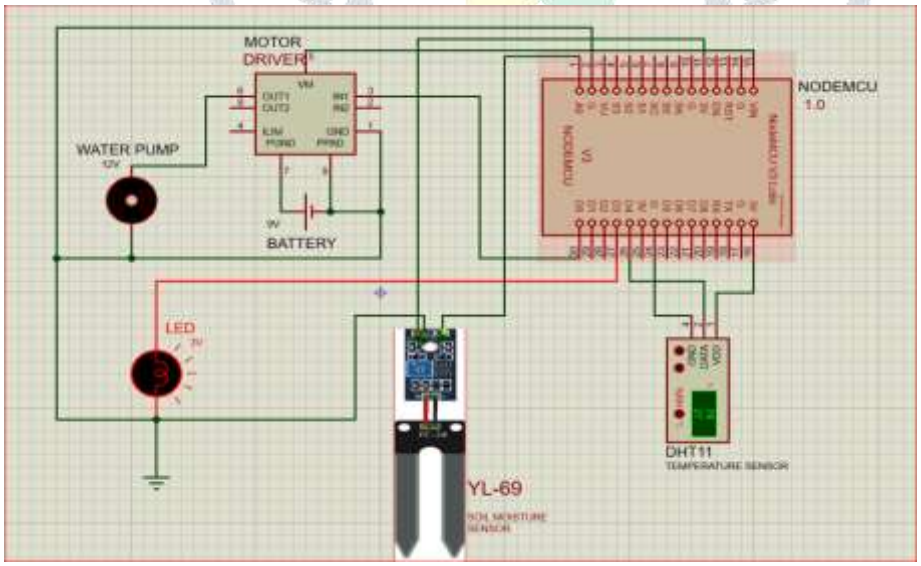

Fig2 Proposed Circuit Diagram of Irrigation System

IV. COMPONENTS REQUIRED

- *NodeMCU ESP8266*: It is a Wi-Fi transceiver, so it can not only connect to a Wi-Fi network and interact with the Internet, and it can also set up a network of its own.

Fig3 NodeMCU ESP8266

- *PIR Motion Sensor:* PIR Sensors are also known as Passive Infrared Sensors. It generates voltage when exposed to heat.

Fig4 PIR sensor

- *Soil Moisture Sensor:* A small charge is placed on the electrodes and resistance through the detector is measured. As water is employed by plants or because the soil wet decreases, water is drawn from the detector and resistance will increase. Conversely, as soil wet will increase, resistance decreases.

Fig5 Soil Moisture Sensor

- *Relay Module:* It works on the principle of an electromagnetic attraction. When the circuit of the relay senses the fault current, it energizes the electromagnetic field which produces the temporary magnetic field.
- Breadboard.
- Jumpers.
- 12V Battery

V. IMPLEMENTATION

A Wi-Fi module (Node MCUESP8266) is connected with a temperature sensor and soil moisture sensor by jumper wire. Ground and Vcc of NodeMCU is connected with ground and 3v of moisture sensor, respectively.We will keep the long wire for the pump for convenience.

Now we connect the pump with the battery. The relay module works on the principle of magnetic force attraction once the circuit of the relay senses the fault current. It energies the electromagnetic field that produces the temporary field. This field moves the relay coil for gap or closing the connections, that's why we have a tendency to connect a relay in between of motor and battery and connect the opposite 2 pins with NodeMCU.

According to the proposed circuit, when the moisture content in the soil is less, water is required, but when the moisture content is enough, then no need to pump the water. The proposed system requires the Arduino program to control the entire setup and Wi-Fi module, a Blynk mobile app to control via phone and put blynk authentication code and Wi-Fi SSID and password to run the system.

The user needs to have an android app named Blynk to control from the smartphone, after setting all values and pin, real-time temperature and soil moisture can be observed by the Blynk app.

When the moisture is low or soil dries user will receive a pop-up message and we can turn the pump on and off with a single tap on the screen.

VI. CONCLUSION

The smart irrigation system carried out is cost-effective for optimizing water resources for agricultural production. We are well aware that irrigation system consumes a large quantity of water and in the upcoming years the demand will certainly increase. Based on these factors we designed a project which is a mobile integrated smart irrigation system using IOT based on application controlled monitoring system. The main purpose behind the design of this project is to lessens the water supply and monitor the plants through a smartphone. The smart irrigation system is automatic, it monitors the soil moisture level, temperature or humanity and sends the data and according to the data, sprinkler gets on or off. This system is volatile and low cost and could be adjusted to the different types of crops. The main motive behind this project is to build a farmer-friendly system that, cost-effective, best time complexity and lessens the consumption of water. Through this project, it can be concluded that there can be considerable development in the field of irrigation with those of IoT and automation. Thus this system is a solution to the difficulties faced in the existing process of irrigation.

VII. REFERENCES

[1] Kansara, K., Zaveri, V., Shah, S., Delwadkar, S., Jani, K.2015 Sensor Based Automated Irrigation Systemwith IOT in IJCSIT, Vol. 1-6.

[2] J. Xu, J. Zhang, X. Zheng, X. Wei and J. Han, "Wireless Sensors inFarmland Environmental Monitoring," 2015International Conference onCyber-Enabled Distributed Computing and Knowledge Discovery,Xi'an, 2015, pp. 372-379.

[3] R.Subalakshmi and Anu Amal,"GSM Based Automated Irrigationusing Sensors" presented at SpecialIssuepublished in International Journalof Trend in Research and Development(IJTRD), March-2016.

[4] R.Suresh, S.Gopinath, K.Govindaraju, T.Devika, N.SuthanthiraVanitha, "GSM based Automated Irrigation Control using Raingun Irrigation System", InternationalJournal of Advanced Research in Computer and Communication Engineering Vol. 3, Issue 2, February 2014.

[5] J. John, V. S. Palaparthy, S. Sarik, M. S. Baghini and G. S. Kasbekar,"Design and implementation of a soil moisture wireless sensor network,"*2015 Twenty First National Conference on Communications(NCC)* ,Mumbai, 2015, pp. 1-6

[6] Ravi Kishore Kodali and Borade Samar Sarjerao, "A Low CostSmart Irrigation System Using MQTT Protocol", IEEE Region 10Symposium (TENSYMP), Cochin, India, 2017, pp. 1-5.

[7] Sumeet. S. Bedekar, Monoj. A. Mechkul, and Sonali. R. Deshpande "IoT based Automated Irrigation System", IJSRD - International Journal for Scientific Research&

Development| Vol. 3, Issue 04, 2015 | ISSN (online): 2321-0613

[8] Z. Stamenković, S. Randjić, I. Santamaria, U. Pešović, G. Panić and S. Tanasković, "Advanced wireless sensor nodes and networks for agricultural applications," 2016 24th Telecommunications Forum (TELFOR), Belgrade, 2016, pp. 1-8.

[9] Sanjiv Singh, "Integrated Wireless Sensor/Actuator Networks in an Agricultural Application", *2004.*

[10] Sonali.D.Gainwar and Dinesh.V.Rojatkar ,"Soil Parameters Monitoring with Automatic Irrigation System" presented at International Journal of Science, Engineering and Technology Research(IJSETR),vol- 04,Issue 11,Nov 2015.