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IOT Based Smart Controller for Irrigation System

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ABSTRACT-- In recent days with increased population of the country and world, there is need for adequate food, water and electricity. The agriculture sector is an important sector of our Indian economy accounts for a good percentage of our nations GDP and exports. With advancement in technology we can establish system that automates the irrigation process such that there is efficient usage of water and create an ease of work load for the farmers. With the help of NODE MCU IOT platform and sensor the smart controller for irrigation system is designed. The proposed model is able to deliver optimal water to the plants based on moisture level which is obtained through sensor and able to protect the motor from fault condition by sensing parameters like over voltage, over temperature, no water at reservoir, and phase detection of the motor. The designed controller includes field monitoring sensor, Node MCU and Blynk app as its main components. Field monitoring sensors use LM358 as a comparator for detecting abnormality of the parameters. It gets regulated fixed 5V DC voltage supply from 7805 regulator and motor gets 12V supply from relay unit. If there is any abnormality of parameter is found the signal is sent to Node MCU unit and further it is sent to Blynk app through IOT platform. So that farmer is able to get updates about field and control the switching ON and OFF of the motor.

Keywords—Field monitoring sensor, NODE Mcu, Blynk app.

I. INTRODUCTION

India is one of the top agricultural country in the world. In India 60% of land is fully dependent on agriculture. It gives major contribution to the economic development and GDP growth of the country and it is fully dependent on the availability of water. According to the survey 35% of the agricultural land is reliably irrigated and about 2/3rd cultivated land is dependent on reservoir. The continuous increasing demand of food requires the rapid improvement in food production technology. In a country like India, where the climatic conditions are isotropic still technology is not able to make full use of agricultural resources. The main reason is the lack of rain and scarcity of land reservoir water.

Irrigation has always been an ancient practice which has evolved through so many stages over the years. Ancestral farmers in a bid to irrigate their farmer sought for various methodologies. Manual irrigation using buckets and watering cans, flood irrigation, drip irrigation, sprinkler irrigation we still being used today. The existing system has several limitations, leaching of soil nutrients, erosion due to flooding, loss of water from plant surfaces through evaporation, water wastage which can result to water scarcity in drought areas and production of unhealthy crops. This problem can be rectified if automatic irrigation system with wireless control using arduino is implemented. In this system irrigation with wireless control using arduino is implemented. In this system irrigation will take place only when there will be acute requirement of water.

The proposed irrigation system senses the moisture content of the soil and turns ON the motor when the moisture content is below threshold value. Similarly, the motor and solenoid valves are turned OFF when the moisture content in the above threshold value. When motor gets overheated it undergoes fault to avoid this we have fixed temperature sensor if it rises above the threshold value motor turns OFF to avoid further faults arising in the motor.

Compared with traditional irrigation system, the proposed project overcomes the loss

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due to excessive use of electricity, water and reduces the human efforts. With the help of interfaced soil moisture sensors, LCD ensuring the equivalent water and reduces the human efforts.

II. LITERATURE SURVEY

1] Chandan kumar sahu, Pramitee Behera, "**A low cost Smart Irrigation Control System",** IEEE sponsored 2nd international conference on electronics and communication system, 2015, 978-1-4788-7225-8/15.

This paper focus on smart irrigation system which is cost effective and middle class farmer use it in form. The objective of this project was to control the water motor automatically and select the direction of the flow of water in pipe with the help of soil moisture sensor finally send the information of the farm field to the mobile message and g-mail account of the user.

2] Monica M, Shankar Dasiga, B. Yashika, Abhishek G.S, Sanjay H.A, **" IOT Based Control and Automation of Smart Irrigation System",** International conference on Recent innovations is signal processing and embedded systems, 27-29 0ctober- 2017, ISBN 978-1-5090-4760-4/17

This paper aims to depict IOT based automatic irrigation system for the Indian scenario. This system is able to deliver optimal water to the plant based on moisture light and temperature levels which are obtained through sensors. The farmer will be able to monitor the parameters through the mobile app which is integrated with cloud storage.

3] M. Sowmiya Manoj, B.Hemalatha, **"Automatic Irrigation Using Microcontroller Basing On Pressure",** International Journal of Pure and Applied Mathematics, 2017, ISSN 1314-3395 (on-line version)

The project is designed to develop an automatic irrigation system which switches the motor ON/OFF for certain period of time on sensing the moisture content of the soil. It uses microcontroller 8051 and an LCD display is also interfaced with the microcontroller to display status of the soil and water pump.

4] Aashika Premkumar, Thenmozhi K, Padmapriya Praveenkumar, P Monishaa, Rengarajan Amrithrajan, **"IOT Assisted Automatic Irrigation System Using Wireless Sensor Nodes",** International conference on computer communication and informatics, 04-06 Jan-2018, Coimbatore, India, ICCCI:978-1-5386-2238-4/18

In this paper proposed methodology uses arduino for moisture sensing and controlling water supply and Node Microcontroller Unit (MCU) for notifying the status of the designed irrigation system to the farmers through mobile communication. Usage of ZigBee RF anteena helps in storing and analyzing the collected data from Farms.

III. METHODOLOGY

In IOT based smart controller of irrigation system Node MCU IOT module is the main controller, sensors like (over voltage, moisture detection, water level detection and over temperature), 3-phase detector, relay unit and water pump are the components used in this project.

Project model gets power supply from two step down transformer. Transformer -1 supplies power to the relay-1 further relay-1 is used for turning ON and OFF of the motor. Maruti-800 car wiper motor is used for prototype model. Node MCU gets 5V power supply from 7805 regulated power supply unit. Field monitoring sensors gets power supply from Node MCU unit itself. Field monitoring sensors has LM358 as a comparator. These sensors works on reference voltage in this model 3.3V reference voltage has been set.

Here Blynk app acts as bi-directional communicator it gets information from Node MCU regarding the condition of sensors and sends back information to Node MCU i.e switching ON and OFF of the motor. Once Node MCU receives the information from Blynk app it is fed to relay-2 so that motor is controlled through Blynk app. Working of motor can be explained using AND logic gate as follows:

Table [1.a]: AND logic gate:

Relay unit 1	Relay unit 2	o/p motor
0	0	0
0	1	0
1	0	0
1	1	1

The motor gets ON only when the output of both relay unit is high. If anyone of the parameter is not appropriate the motor does not switches ON further this information is sent to the farmer. The different parameters like over temperature, soil moisture, no water level and over voltage parameters gets supply of 5V DC from 7805 fixed voltage regulator. Then this signal from sensors are fed to the IOT based node MCU platform through internet this message is sent to Blynk app of authorized person so that farmer can switch ON and OFF the motor through android phone. This proposed project reduces the burden of the farmer.

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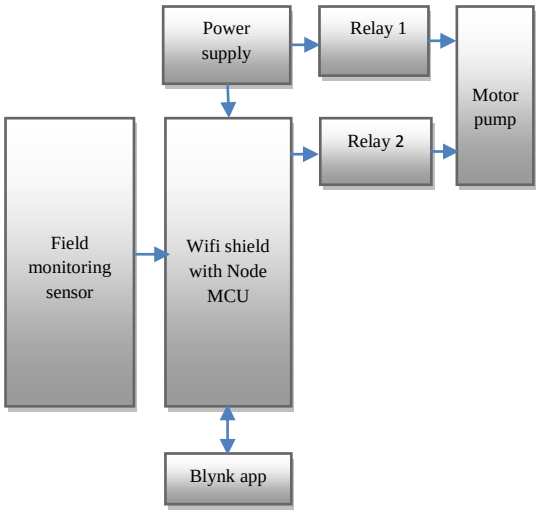

Fig 1: Block diagram of proposed model

IV. REQUIREMENTS

In order to build the proposed model we have used following hardware and software components:

a) Field monitoring sensor:

Field monitoring sensor consists of soil moisture, over temperature, over voltage, no water at reservoir sensor and phase detection switch. Soil moisture sensor is used for supplying optimal water to crops. No water at reservoir is used to detect the water level at reservoir. Over voltage and over temperature are used to detect the variation in voltage and over heating of motor respectively. Phase detection switch is used to detect the power supply available for starting motor. These all sensors are used for optimal supply of water to field and to maintain healthiness of motor. These sensor uses LM358 as comparator.

b) Power supply:

230V AC power supply is fed to two step down transformer having ratings of transformer1 (12V, 1A) and transformer2 (9V, 1A). Transformer 1 uses center tap transformer for conversion of 12V AC to 12 V DC for supplying power to the relay1 and further it is used for switching ON and OFF of the motor. Transformer 2 uses bridge rectifier and 7805 regulated power supply to obtain fixed 5V DC power supply for supplying relay 2. Further it is fed to NODE MCU for supplying power to sensor circuit.

c) Blynk app:

Blynk app is used as bi-directional communicator in this model it receive message from NODE MCU and sends back message to NODE MCU. It is an IOT platform with IOS and Andrid apps to control NODE MCU. By creating new project in blynk app sends authentication code to authorized person.so it is safe and secure use.

The messages from sensors are sent to IOT platform then message is conveyed to authorized person using Blynk app. In our project the information related to soil moisture, temperature, over voltage and water level detection are sent to farmer using blynk app. So that it facilitate farmer for switching ON and OFF of the motor by staying away from the field.

d) Node MCU:

It is a low cost open source IOT platform. It is initially included firmware which runs on the ESP8266 Wi-FI Soc from Espressif Systems, and hardware which was based on the ESP-12 module later it support for the ESP32 32-bit MCU was added. NODE MCU Wifi kit has 16 pins (11 usable digital and 1 analog) are present. It consumes maximum current per I/O of 12mA. In our project it provides supply for all sensor circuit and receives signal from sensors. Node MCU further sends message signal to Blynk app.

e)Relay unit :

Relay acts as electromagnetic switch, and can be used to control the external devices with isolation and the internal structure and working as When the relay is off common is in contact NC contact (normally closed) and it is ON if common is open with respect to NO contact (normally open). In this model it uses two Relay unit one is for controlling switching ON and OFF of the motor and it is directly interfaced with power supply. Other relay is connected to NODE MCU for obtaining signal from NODE MCU and act according to instruction given by farmer.

f)Motor pump:

A heart of most of irrigation system is a pump. To make an irrigation system as efficient as possible the pump must be selected to match the requirements of the water source, the water distribution system and the irrigation equipment. In this project for prototype model car sniper motor is used but in case of real time this project can be implemented for both submersible pump and centrifugal pump. In this project motor requires 12V-15V as its power supply at 1A. It is provided

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by relay-2. Motor works on AND logic in this model.

V. RESULT

Through this project we have been able to control the motor according to the different sensor parameters like soil moisture level, no water at reservoir, over temperature, over voltage and 3-phase detection switch. We have made it such that the pump is turned ON using Blynk app whenever the moisture level goes below the threshold value. In case of any abnormal parameter is found in motor it is sent to Node MCU unit and further it is sent to the Blynk app. So that farmer is able to control the switching ON and OFF of the motor by staying away from the field. Fig 2 shows sensor status received through Blynk app.

Fig 2: Sensor status received through Blynk app

VI. CONCLUSION

The proposed model "IOT based smart controller for irrigation system" uses optimal resources to improve the efficiency of the irrigation system. This project prototype includes sensing element Node MCU, these sensing element nodes are deployed in the field and motor for sensing parameters like soil moisture, over voltage, over temperature, no water at reservoir and 3-phase detection. According to the soil moisture and other sensor parameters helps in controlling switching ON and OFF of the motor using threshold values of sensors. Hence by having such type of model we could be able to increase the production, conserve the water (i.e by supplying optimal amount of water to plants for avoiding over irrigation and under irrigation), save human energy, time and cost.

VII. FUTURE SCOPE

The following options can be included in the project for future enhancement of the project:

1] Alarm System can be used to alert the Farmer: Owner in case of any unusual activities on the field this can be obtained by having sensors around to monitor the field by installing a live surveillance which can detect unusual movement by image processing.

2] Installing of a solar panel for providing electricity instead of AC supply: As solar energy is a renewable source and available in abundance, this can be used to save energy.

3] Providing different types of irrigation according to crops: Not limiting to ourselves to one type of watering method but using drip irrigation, sprinkler irrigation and etc as different crops need different type of watering system.

4] Taking weather into account: To be able to control the irrigation according to the weather such that we can predict when to water the crops and when not to according to when the next rainfall would be this prevents over flooding.

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