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SMART IRRIGATION AND DRAINING SYSTEM USING IOT

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Abstract - *Water is an essential component used for agriculture . Agriculture plays a vital role in the development of agricultural country . A farmer do cultivation by monitoring the fields day and night for watering the plants if the field is dry and draining of water when water is in excess quantities which causes harm to the crop and the soil . To reduce burden to the farmer we come up with a solution called Smart Irrigation and draining system .Earlier system deals with only watering the crop without draining and our project deals with watering crop by checking soil moisture conditions and also draining of excess water from fields automatically by using the concept of IOT with the help of sensors and Arduino . The equipments that are used in this system helps farmer to know about the status of fields . This project reduces human effort and avoids human monitoring in case of watering the crop and draining of excess water.*

Key Words: NodeMCU, Arduino, Soilmoisture sensor, Rain Sensor, Relay, Mini Submersible motors.

1. INTRODUCTION

Farmer spend most of his time and effort in monitoring the fields to water his plants and also draining of extra water .Now a days there arises scarcity of water. Since water is the most essential component that every needs for longer and longer, we need to save water i.e we have to use water is an efficient manner.

The objective of this system is to overcome unnecessary water wastage in the fields and also to reduce burden on the farmer. The system proposed is an innovative system which automatically pumps the water to the plants when the soil moisture is dry and drains out the excess water when water is in excesss quantities automatically. The system makes use of NodeMCU, Arduino UNO, Soil moisture Sensor, Rain Sensor, 2 Channel relay, mini submersible motors.

2. RELATED WORKS

Many applications have been designed for smart irrigation. Smart irrigation have features like smart control of water pump i.e automatically turning on/off the pump after acquiring required moisture level in auto mode. Switching water pump on/off remotely via mobile or computer in manual mode, and continuous monitoring of soil moisture. These are the features of different existing systems.

The main drawbacks with the current systems (existing systems) are if farmer uses his mobile phone and made the pump on i.e motor on with the intention of keeping more water than usual then currently existing systems does not support since they does not have this feature and also that the status is not updated in farmer mobile.

3. PROPOSED SYSTEM

In our proposed system we have combined the ideas that are implemented on various systems and we developed a single system for the first time which provides all the features of the previously existing systems and the extension to existing systems is draining system that we proposed based on the phenomenon of irrigation motor.

We proposed a reliable system which can overcome the unnecessary wastage of water. This system deals with automatic supply of water to the plants when the soil moisture is dry. When farmer wants to increase the level of water then at that situation even if the soil has moisture content, irrigation motor gets on by using mobile and water stops automatically after reaching certain level which is done with the help of soil moisture sensor.

The extension to the existing systems is that, in case of excess water, the draining motor gets on automatically and drains the excess water. In the proposed system we use rain sensor to inform the farmer about the status of rain in his fields which is very useful when farmer is in out of station. Not only about rain but also each and every time to time status about the fields is shown in the IoT platform we are using.

The block diagram of our proposed system is shown in Fig 1.It consists of soil moisture sensor , Arduino UNO,nodeMCU,2 relay module, motors, rain sensor.

The moisture content values from soil moisture sensor is passed to the node MCU and according to the values nodeMCU passes the signal to the relay which turns the motors on/off.

Here there are two motors called irrigation motor and draining motor which are switched on/off by the relay according to the signal passed from nodeMCU.

NodeMCU updates the status in the Blynk IoT platform that we are using here.

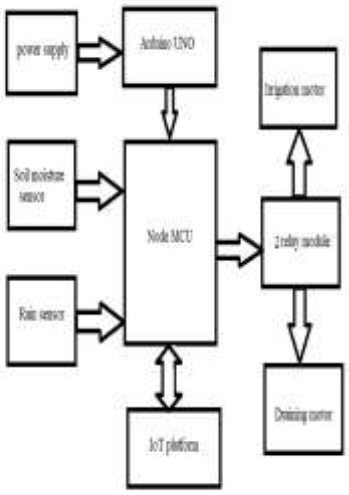

Fig 1: Block Diagram

4. HARDWARE COMPONENTS

4.1. Arduino UNO:

Arduino is a board on which microcontroller is present which is programmed by using ArduinoIDE in which the code can be written and dumped into the board. Arduino board is also used to supply power to other components in the system. We can also use python language to code arduino. In general we use embedded c language to code arduino. It is able to read inputs like a finger placed on a button, lighton a sensor or a twitter message and turn it into output like activating a motor, turning on an LED etc. The purpose of arduino UNO board in our system is to supply power.

Fig 2: Arduino UNO

4.2. NodeMCU:

Node MCU is a WiFi module.It acts also as a microcontroller. NodeMCU is having 4MBytes of ROM (blaze) and UNO is only 32 KB, NodeMCU can store more code contrast with UNO.ESP8266 that comes along with nodeMCU can be programmed by using Arduino IDE .We use nodeMCU in our system as both WiFi module and also microcontroller. The code written by using arduino IDE is dumped into this board.

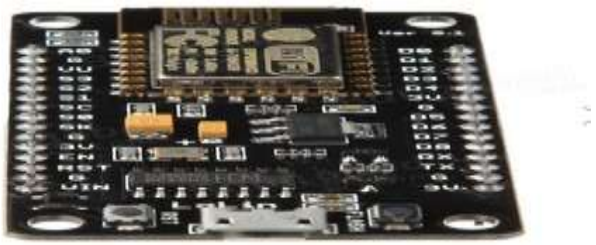

Fig 3: NodeMCU

4.3. Soil moisture sensor:

A soil moisture sensor measures the quantity of water present in a material i.e soil. Moisture content should be optimum for plant growth. Soil moisture sensor helps to maintain the soil moisture in a proper way by monitoring it. The soil moisture sensor senses the soil and the value measured is sent to the controller to process the data. The controller based on the value sent by the soil moisture sensor performs necessary actions by passing the input to the relay based on which motors get on/off.

Fig 4:soil moisture sensor

4.4. Rain sensor:

Rain sensor is a device that is activated by rainfall. Rain sensor senses the rain and passes the signal to the microcontroller which update the status in the mobile application.

Fig 5: Rain sensor

4.5. 2 Channel Relay:

Relay is an electrically operated switch that gets the input from the microcontroller. Based on the input it receive, the relay turn the motor ON or OFF.But relay is capable of supplying only 5v which it gets from arduino board but that

power is not sufficient to turn the motors on .So that external power is supplied to the motors from 9V batteries.

Fig 6: 2 relay module

4.6 Mini Submersible Motors:

This Mini Submersible motor is a low cost, small size submersible pump motor .It can take up to 120 liters per hour with very low current consumption of 220mA.Just connect tube(pipe) to the motor oulet, submerge it in water and power it.

Fig 7: Submersible motor

5. WORKING PRINICIPLE

The functionality of this system is detection of soil moisture content and perform irrigation or draining according to it.

Soil moisture sensor is placed in the soil. This sensor sense the moisture content which is present in the soil, whatever the value that the sensor gets will be passed to the nodeMCU and there will be a comparision done between the threshold value and existing value. After this node MCU will pass the input to the relay(which acts as a electromagnetic switch).Relay switches the motors on or off according to the signal passed by nodeMCU.

When soil moisture is low, node MCU pass the signal to the relay to on the irrigation motor, when moisture is sufficient then both irrigation and draining motors are in off state which is done by nodeMCU and when soil moisture is high nodeMCU pass signal to the relay to on the draining motor and it gets off automatically when moisture reaches sufficient level.

6. RESULTS

If a soil moisture content is less than the threshold value i.e dry then irrigation motor gets on.

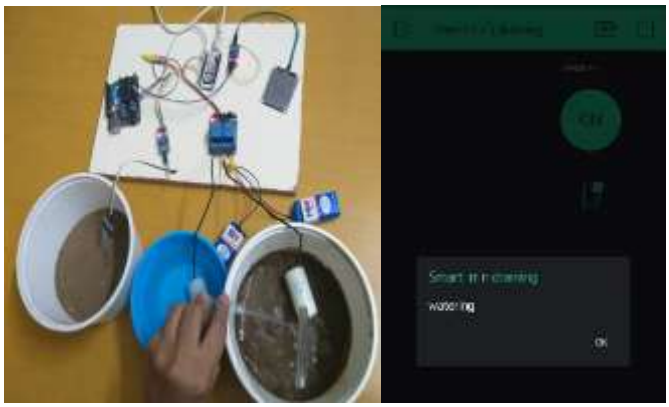

Fig 8: Irrigation result

If moisture content is very high than the threshold value then draining motor gets on and remove the excess water from the field and this in parallel is also notified in blynk app.

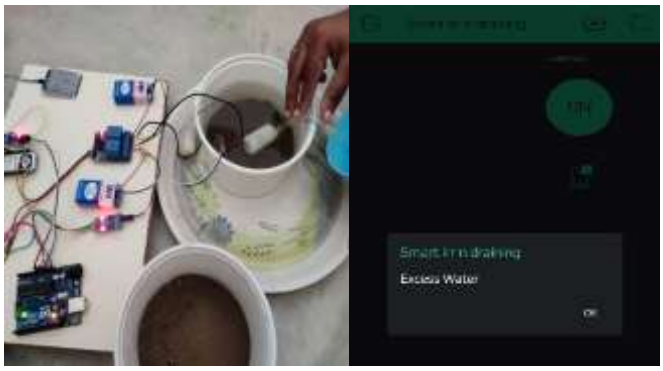

Fig 9: Draining result

If the moisture content is in medium range, then both the motors gets off. Whenever there is rain fall then rain sensor immediately pass input to the nodeMCU and hence the status of rain is intimated in blynk app.

Fig 10:All off

Fig 11:Raining

Since we are using water in an efficient manner, in case if farmer wants to increase the level of water then he can make manual on through the blynk app and this is possible if water content is below all off condition. All the notification regarding field status will be viewed by the farmer through the blynk app and the status of the field is shown in the Blynk app.

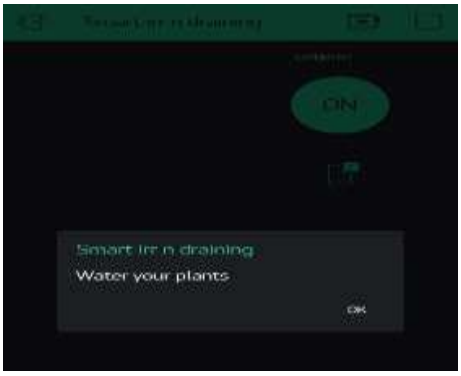

Fig 12: water the plants from app

7. CONCLUSION

The main objective of the project is to control the water wastage. Smart irrigation and draining system is controlled automatically as well as manually whenever required without the presence of farmer in field. This system is used to reduce the burden and time of farmer and also this is more efficient than the existing systems. By measuring moisture content in the soil, system starts working automatically and also with the help of blynk app immediate notification about the field condition is passed to the farmer including the status of rain in the fields.

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