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Smart Irrigation System and Using IOT

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Abstract: Due to high population the needs of human being is also increasing day by day. Simultaneously the problems are also increasing. One of the main and important problems is water scarcity and water is important factor for agriculture. It uses large amount of water. Therefore, a system is required which uses water in required quantity without wastage of water is required. Such system is called as "SMART IRRIGATION SYSTEM". It is based on IOT i.e., Internet of things. This system saves water as well ashuman effort. In this system the water will be supplied according to the requirement of crops. This automatic system is depended on moisture which will be sensed by soil moisture sensor and the result will be passed to ESP8266 Wi-Fi. In ESP8266 the code is burn in which the water required to each crop is already set. For interface of user Android app is developed. Using the app, the user selectsthe required crop and turn ON the motor. In such way the system supplies the water to field and beneficial for farmers.

Keywords*:* IOT project, IOT smart irrigation, Smart irrigation system, Electrical eng. Project.

I. INTRODUCTION

Agriculture is one of the sectors that give profit to the economy of our country. Based on their motto, "agriculture is life for more than 85%", the government has invested more money to develop the technology in order to increase the productivity of agriculture. Saving water is most important issues in dry lands. It is also an important element for the plants to survive. Therefore, the humidity of the soil that determines the amount of water in soil must be checked regularly to prevent the plant from wilting otherwise in the worst case it might die. Besides, each species of the plant has its own characteristics.

So, the consumption of water is different following their type. For example, cactus does not need a lot of water in order to survive. It just needs to be sprinkled once or twice of a week. To become part of the government effort on giving the new spirit to the agriculture sector, a system which monitors the humidity of the soil will be developed so that the end user such as farmer, gardener and so on can use it to determine the exact time to water their plant.

Keeping these facts in mind, we decided to tackle part of the problem by trying to improve the efficiency of water use in irrigation systems. Common methods of water distribution can be enhanced or replaced by using recent technological advances. Wehope to use it to improve the efficiency of water distribution, to automate the process of irrigation management, to provide an easy-to-use programming and reporting interface, and to provide a scalable, versatile base from which to expand or modify if needed. Toavoid this problems farmer's uses drip irrigation, sprinkle irrigation etc.

But the farmer spends lot of time to irrigate the field. They personally want to visit the field and according to moisture insoil they supply water to farm. They will switch ON motor after irrigate the field they switch OFF the motor.

This whole process is time consuming and farmer doesn't do any other activities. All this can be avoided using smart irrigation system because these systems focus on automation. The farmer can supply the water to field by sitting at home through android phone. In this system the water will be supplied and the soil moisture sensor will detect the moisture quantity and pass thedata to WI- FI module. According to the program the motor will OFF using relay. The water can be supplied according to the requirement of plants.

II. METHODOLOGY

In below fig. shows the sequence diagram, it is an interaction diagram that shows how processes operate with one another and in what order. A sequence diagram shows, as parallel, vertical lines(lifelines), different processes or object live simultaneously, and ashorizontal arrows, the message exchanged between them, in the order in which they occur. After supplying required water to plant, sensor send moisture level to system and system perform last process i.e. to turn OFF the motor. In such way the project follows sequence diagram.

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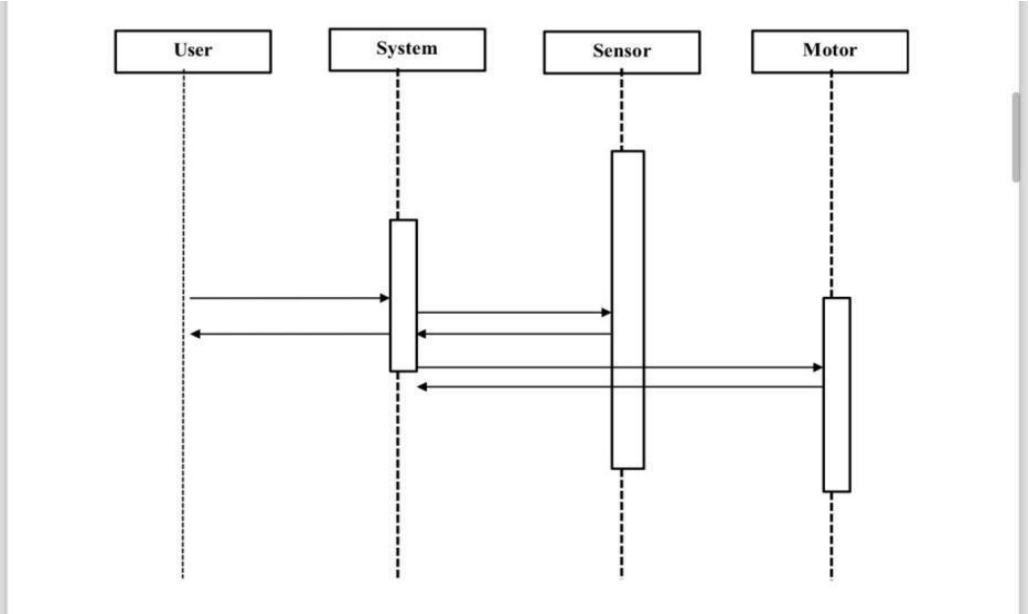

Fig. 1 Methodology of project

III. MATERIAL REQUIRED

Software Requirements

1. Operating System : Windows 7 or above.
2. IDE : Arduino IDE.
3. Client Side : C and C++

Hardware Requirements

1. ESP8266 Wi-Fi module
2. Soil Moisture Sensor
3. Relay
4. Submersible water pump

1. ESP 8266 Wi-Fi module:

Fig. 2 ESP8266 Wi-Fi Module

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ESP8266 is a complete and self-contained Wi-Fi network solution that can carry software applications, or through another application processor uninstall all Wi-Fi networking capabilities. ESP8266 when the device is mounted and as the only application ofthe application processor, the flash memory can be started directly from an external Move. Built-in cache memory will help improve system performance and reduce memory requirements. Another situation is when wireless internet access assumes the task of Wi-Fi adapter, you can add it to any micro controller based design and the connection is simple just by SPI/SDIO interface or central processor AHB bridge interface. Processing and storage capacity on ESP8266powerfull piece, it can be integrated via GPIO ports sensors and other applications specific equipment to achieve the lowest early in the development and operation of at least occupy system resources. The ESP8266 module is an extremely cost-effective board with a huge, and ever growing, community.

2. Soil Moisture Sensor:

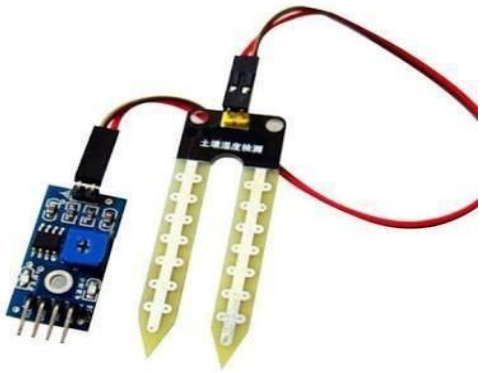

Fig. 3 Soil Moisture Sensor Module

This sensor can be used to test the moisture of soil, when the soil is having water shortage, the module output is at high level, else theoutput is at low level. By using this sensor one can automatically water the flower plant, or any other plants requiring automatic watering technique. Module triple output mode, digital output is simple, analog output more accurate, serial output with exact readings.

Specifications: Operating Voltage= +5v dc regulatedSoil moisture =Digital value is indicated by out pin

3. Relay & Submersible Water Pump:

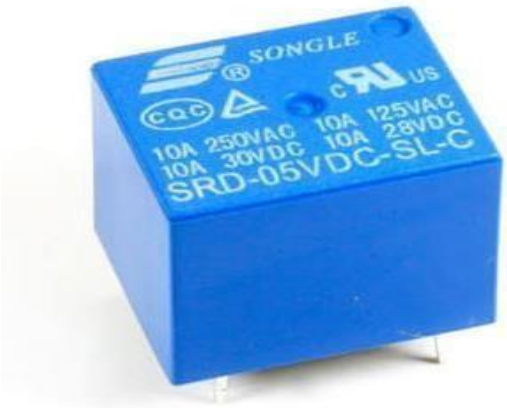

Fig. 4 Soil Moisture Sensor ModuleFig.

Fig. 5 Soil Moisture Sensor Module

Above Given Material is used in the Project the material is changed as per application the proper rating of should be usedfor the require output.

Requirement of ESP MOdule for connection with Wi-Fi / Hospot as follows: -

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1. ESP Module:
Choose the appropriate ESP module based on your requirements (e.g., ESP8266 for basic Wi-Fi connectivity, ESP32 for moreadvanced features).

2. Power Supply:
Ensure a stable power supply to the ESP module. This could be provided via USB, battery, or external power source.

3. Wi-Fi Network Information:
SSID (Service Set Identifier): This is the name of the Wi-Fi network you want to connect to.
Password: The password required to access the Wi-Fi network (if it's secured with WPA/WPA2 encryption).

4. Wi-Fi Library for ESp:
Utilize a Wi-Fi library compatabile with your ESP module E.g., ESP8266 yo u might use the ESP8266WiFi library while for theESP32 You might use the WiFi library.

5. Software development Environment:
Set up your preferred development environment such as Arduino IDE or PlatformIO with the necessary tools and libraries for programming the ESP module.

6. Code for Connection:
Write code to initialize the Wi-Fi connection on your ESP module. This typically involves configuring the Wi-Fi SSID andpassword, and then attempting to connect to the network.
Handle connection status and errors appropriately in your code, allowing for retries or fallback mechanisms if the connection failsinitially.

7. Optional: Access point (Hospot) mode:
If you want your ESP module to act as an access point (creating its own Wi-Fi network), you'll need additional code to set it up inAP mode.
Define the SSID and password for the access point mode if needed.

8. Serial communication for debugging:
Use serial communication to debug your code and monitor the connection process. Print out relevant information such as connectionstatus, IP address, and any error messages.

By fulfilling these requirements and implementing the necessary code, you can successfully connect your ESP module to a Wi-Fi network or set it up as a hotspot. Always remember to handle errors gracefully and provide adequate feedback through serial communication for troubleshooting purposes.

IV. SYSTEM DESIGN

We proposed a system called as “SMART IRRIGATION SYSTEM” its main motive is to \reduce wastage of water. This system is applicable for drip irrigation. In smart irrigation system the water is supplied to the field using the android app. In the android app we have provided the facility to choose a particular crop and already the crop has set a water level i.e. water quantity required to that particular crop. Due to which only required water will be supplied to the root of plants. After crossing the particularlimit of the water quantity, the motor will OFF and current status will be display on the app. This system helps to farm to supply thewater without visiting the farm. He can do other activity simultaneously. Whenever he needed to supply the water (problem related to electricity) he can easily supply the water.

V. DATA FOLLOW DIAGRAM

A data flow diagram (DFD) is a graphical representation of the "flow” of data through an information system, modelling itsprocess aspects. A DFD is often used as a preliminary step to create an overview of the system without going into great detail, whichcan later be elaborated. DFDs can also be used for the visualization of data processing (structured design).In above fig. 2, data flows start from user using user interface. The user interface is connected to proposed system.

When user give instruction through user interface a request ( ) goes to proposed system. According to the request the signal is send to motor which act as an output device. To process the instruction the signal is send to motor. Motor do its work and give reply to proposed system. After signal received from motor the system give response to user through user interface.

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In such a way thedata flows within the system. As per shown in below fig. 6.

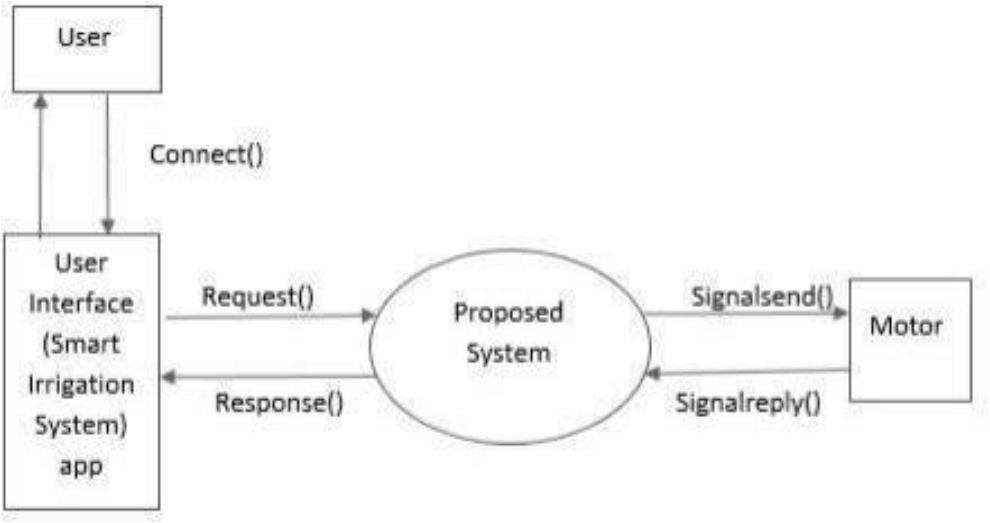

Fig. 6 Methodology of project

VI. WORKING

In below Fig. 3 block diagram, after supplying power supply when we give instruction to ON the motor through app or manually using switch the instruction goes to ESP8266 Wi-Fi module. ESP8266 Wi-Fi module is a complete and self-contained Wi-Fi network solution that can carry software application. According to the program burn in Wi-Fi module the motor will ON using relay. Relay is electromagnetic device which is used to isolate two circuits electrically and connect magnetically.

The soil moisture sensor act as an input to the ESP8266 Wi-Fi module. The soil moisture sensor used to sense the moisturefrom the farm. It detects the moisture of the soil after reaching to a required water quantity it give the message to Wi-Fi module. Asper the code the motor will be OFF using relay. And current status of moisture and motor will be displayed on app which is carried by ESP8266 Wi-Fi module.

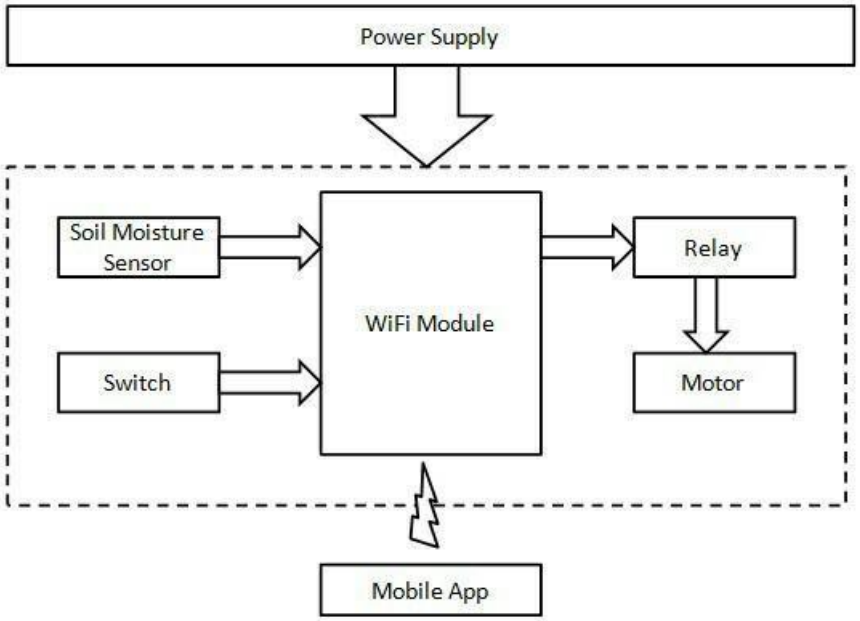

Fig. 7 Construction diagram of project.

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VII. APPLICATION

1. The system is to be able to control up to the last drop and to evaluate the real quantity of water required depending on the crop and type of soil. This is a very positive featurethat allows you saving on water with zero waste.
2. This system is applicable to small field as well as for large field.
3. Make maintaining yard easy and convenient
4. A reliable and efficient system for monitoring the environmental parameter.

VIII. FUTURE SCOPE

In future, instead of wired network we can replace it using wireless component like wireless soil moisture sensor. We can also use RFID technology for making wireless system. We can add electric solenoid valve at each phase it can be controlled automatically through arduino or using ESP8266 Wi-Fi module.

CONCLUSION

The project “SMART IRRIGATION SYSTEM” is used for the optimization use of water in agriculture field without the intervention of farmer by using soil moisture sensor that senses the moisture content of the soil using Esp8266 Wi-Fi module that turn ON-OFF the motor according to the instruction given from the android app. In this system only required water is supplied to the each crop andthe current status of field is shown on android app.

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