IOT Based Smart Agriculture System For Crop Monitoring And Management

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Abstract - The aim of this project presents a Low Cost GSM Based Automated Irrigation System Using Arduino, Sensors and GSM Module. We use GSM Module so the Module sending the data to the Thing-speak server where it acts as front end to observe the sensor dynamic values and we can check the status of the water pump. It also acts as back end to store the data. The prototype is design in such a way that it will pump the water into the field as per our requirement depending on the weather conditions. The sensors used in the system are DHT11 Sensor (for sensing both humidity and temperature), Water Flow Sensor, Soil Moisture Sensor.

Key Words: Temperature, Humidity, Soil Moisture Sensor, Relay, Water Pump motor, Internet of things, Sim 800gsm module, etc.

1.INTRODUCTION

Day by day, the Smart Irrigation System Technology is getting advanced in its field. Worldwide, Agriculture is playing a main lead for mankind. Most of the people in India rely on vital part of agriculture. In previous days, farmers were dependent on the mills to irrigate the farm land by old methods where they irrigate without knowing the appropriate quantity of the crops. These old and conventional methods don't use natural resources like water properly and also destroy some crops due to lack of irrigating field properly. Recent times in India, farmers are using irrigation technique where the person itself has to irrigate the land time to time. In such case, sometimes we may have wastage of water. If we have irrigation system which runs automatically, there we can supply required amount of water without any wastage. It requires more time to irrigate a farm land when we can save our time by making it automatic. In recent times, advanced technologies are used to reduce the human efforts and also to reduce the time consumed to irrigate the farm lands. Water is one among them which is wasted excessively. One of the methods is Mass irrigation which is used to water the plant. By following this method there will be large amount of water loss. Through the holes of the pot, the excess amount of water gets discharged

In this project, we will rectify the problems faced by the farmers like error in irrigating sufficient amount of water and conservation of electricity. And the errors like irrigating excess amount of water during rainy season. We will also check whether the water is flowing through the motor during irrigation, if the water flow sensor detects that the water is not flowing through the motor, we stop it autimatically, there increasing the efficiency of the motor and we save electricity. We must have to make efficient ways in creating the system to

get the desired output. Therefore, we must have great efforts to achieve it. Here the farmers should play the main lead in the advancement of the Modern irrigation system. The need for farming products is increasing day by day while increasing in population. Further, the potentiality and ability of the farmers are reducing day by day in the agricultural field. The income in agriculture needs to continue development regarding the prediction of world population increases from 7.8 billion in 2020 to over 10.5 billion by 2051. Efficiency has become an essential demand with the decrease IOT Based Smart Agriculture System For Crop Monitoring And Management in the farmer's potential. Objectives of this project are facilitated and simplify the irrigating system by installing and designing the whole automatic IOT irrigation system and to observe all the reading of the installed sensors from home, increases field performance by reducing excess watering from saturated soil. When it is not necessary it will stop watering the field with the help of relay which is programmed accordingly

1.1 Existing system

In the present system, to send the exact field condition GSM Module is used, and the data is transferred to the owner in SMS but we can't observe the dynamic sensor readings. It also controls the DC Pump with the help of soil moisture sensor, but it couldn't able to detect the water flow, where there will be a loss in electricity if water is not flowing through the motor. They are programmed in such a way that, they will work according to the weather conditions with the help of DHT11 sensor (It can detects both temperature and humidity) but which are not accurate at some certain conditions. This system does not required any human effort but it fails the efficient consumption of electricity.

1.2 Proposal system

This project is actually an irrigation system which is worked automated, mainly focused to for use of water and electricity efficiently. It is programmed to sense the moisture, rain, humidity, temperature with the respective sensors. Here, if the reading of the moisture level is low than the predefined value, then the pump will automatically switches on with the help of Arduino to pump water to the farm field, when system detects moisture content in a sufficient amount in the soil, water pump gets OFF automatically. Whenever module switches the pump OFF or ON, a Data Iot Based Smart Agriculture System For Crop Monitoring And Management will be delivered to the thing speak server through the GSM module, the user can observe the sensor dynamic values and check the water pump status using thing-speak server and the notification send to the user in the form of SMS. So, it is an Automatic Plants Watering System.

There already exist so many smart water system that irrigates plants, with supporting soil moisture. These types of system are very much essential for the high productivity of soil for Big Agricultural Industries. In future days, these types of system will play a great role in simple farm lands like in house premises, office premises and in garden areas, where the system waters the plant whenever it is required. We also install a water flow sensor to the motor, so when water doesn't flow through it, the motor will stop automatically.

Fig -1: Experimental flow of the Project

2.LIERATURE SURVERY

The system that presents a wise irrigation system appropriate to be used in places wherever water inadequacy could be a challenge. These kinds of typical irrigation system had many issues like increase in work of farm labor and infrequently it result in downside like excess-irrigation and activity of soil. good irrigation system is thereby believed to be a serious answer. therefore here creating GSM primarily based automatic Irrigation System victimization Arduino, that mechanically provides water to crop field and keep farmer updated by causation message to telephone.

2.1 GSM Based Irrigation System

The system which will irrigate the farm field automatically with the help of Arduino, which is pre-programmed. Here the Arduino board is connected to a moisture sensor of soil which will detect the level of moisture in soil. If the moisture sensor of soil detects a less moisture level in the soil, automatically the water pump will irrigate the soil at a accurate amount. A cellular communication system will be executed by GSM (Global System for Mobile Communications). Programmed messages are sent to the actual owner or the farmer whenever it is needed, where the farmer can observe the plant's condition from home.

2.2 Automatic Irrigation System Using Arduino

The system that relies on an automatic system that is employed for watering plants. The system provides water to the plant automatically once it's needed. The soil moisture will sense the moisture content of the soil. Water conducts electricity, therefore less resistance implies that there's water present within the soil. Whenever there's additional resistance, it means that there's less water within the soil. pi can activate or OFF the motor. The planned paper gift AN economical, fairly low cost and straightforward automatic irrigation system.

this technique once put in it's less of maintenance value and is simple to use. By exploitation the digital camera with appropriate application on itinerant we can simply on-line observance the particular state of affairs of the sector and sensors like soil wetness and temperature are accustomed offer the knowledge concerning changes happens within the field. it's a lot of advantageous than the standard agriculture techniques.
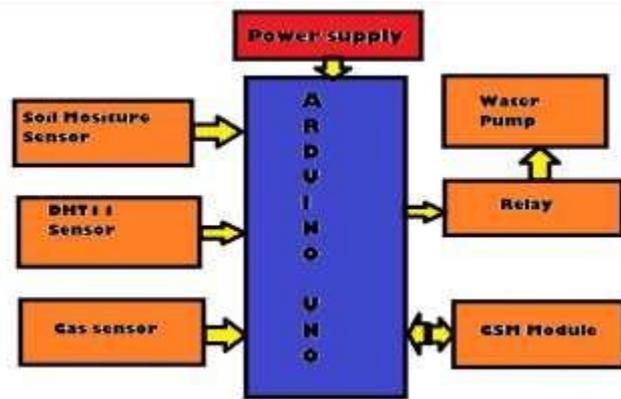
3.SYSTEM REQUIREMENT & MODULE

For a project, it is must that we should have right equipment at right cost to get the desired system. So, before that we should have a good idea and plan to implement the project.

3.1 Arduino Micro-Controller

The Arduino is like FPGA we can upload any program and use it accordingly. It is a user-friendly the user can use one Arduino board for different purpose. Arduino uses different processor's the main processor used in most of the boards are ATmega328, this processor contains 28 pins and it is like a CPU for system.

The Arduino uses DC power supply 5v and the Arduino UNO micro-controller having 2 KB SRAM so the UNO board having limitations. According to your project you can choose different types of board. It has 32 KB flash memory whenever the program lode from IDE stored in flash memory. The Arduino UNO has 1 KB of Electrical Erasable Programmable Read Only memory, and it stores the data whenever the device is reset. It has runtime memory of 2 KB. The Arduino UNO having digital and analog pins. Digital pins is used for digital data and for displaying the data in LCD. The analog pins is used for reading the sensor data

Fig -2: Arduino UNO

Arduino UNO is one of the board in the Arduino boards. Arduino UNO can control the physical applications like Washing Machine and reduce the human effort. The Arduino is like FPGA we can upload any program and use it accordingly. It is a user-friendly the user can use one Arduino board for different purpose. Arduino uses different processor's the main processor used in most of the boards are ATmega328, this processor contains 28 pins and it is like a CPU for system. The Arduino uses DC power supply 5v and the Arduino UNO micro-controller having 2 KB SRAM so the UNO board having limitations. According to your project you can choose different types of board. It has 32 KB flash memory when ever the program lode from IDE stored in flash memory.

3.2 Sim 800GSM Module

A GSM module works with the help of AT commands, and the GSM is mainly use for communication, an SMS and the data transfer. Here we use a gsm800c it has a

Quad-band GSM/GPRS. The user can used for the custom applications. This module is a sub-system, and we can use it for the cellular IOT applications. With the help of different AT commands one can send the data and receive the data, and we can check the registration status, a pin code for the sim status, a connection status and check it is connected the single or multi IP connection. The GSM module uses the 12v power supply, and it has dual-band for GSM 900MHz and for GPRS 1800MHz. It has an inbuilt TCP/IP protocol so the data can transfer through internet over GPRS band. This module can connect with a micro-controller with the help of a trans-receiver pins.

Fig -3: GSM Module

3.3 Soil Moisture Sensor

The soil moisture sensor work with analog pins of Arduino because of the soil moisture sensor read the data continuously and it sends the data int the form of a bit rate from 0 to 1024. The bit rate is converted in to the percentage with the help of the map function in Arduino IDE. The soil is dry then the power conductivity is very low and the resistance is very high so, it sends the data to Arduino as a soil moisture is very low. When the soil having enough moisture than the power conductivity is very high and the resistance is very low so, it sends the data to Arduino as a soil moisture is high.
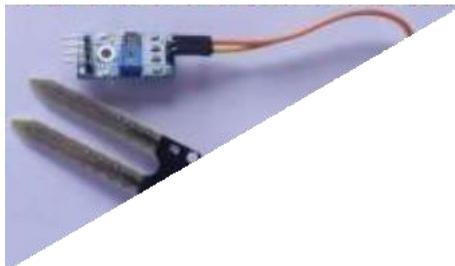

Fig -4: Soil Moisture Sensor

3.4 DHT11 Sensor

The DHT11 sensor is use to detect both humidity & temperature, and it is a semiconductor device. The sensor having two electrodes and it can hold the moisture substrate in between dielectric when the humidity level is changed then the capacitance values also changed accordingly. The sensor having an IC it can change the analog values into the digital form.

Fig -5: DHT11 Sensor

3.5 Relay

A Relay is an electric switch it work with any micro-controller and it can control voltage and current with an Arduino. When the Arduino gives the input relay pin is low/high the relay is turned on/off accordingly. Relay has Nursing electromagnet with the help of electromagnet the relay Turn on/off the switch. In Relay can isolated negative feedback.

Fig -6: Relay

3.6 DC Pump

The DC pump (or) a centrifugal pump having a motor and an impeller, and the impeller is connected the motor with the help of shaft. When the motor is ON then the impeller is rotated and the water can be pumped through the DC pump. The impeller is surrounded by air tight passage.

Fig -7: DC Pump

4. CONCLUSIONS

The system i.e., "IOT Based Smart Agriculture System For Crop Monitoring And Management" is highly essential, suitable, and low cost for advanced water irrigation technique and for production of agricultural. With the help of GSM Module the system will be sending data to the user through Thing speak server where he can observe those sensor values in the farm field and irrigate accordingly from home. We can also include many more weather sensors that affect the crops. This prototype is designed in such a way that it will reduce the human effort and also manages the natural resources in a correct manner and give a good productive crops.

5. FUTURE WORKS

The "Low Cost GSM Based Automated Irrigation System Using Arduino, Sensors and GSM Module" is simple and precise way of irrigation. Hence, this method is incredibly helpful because it reduces manual work of the farmers and additionally helps within the proper utilization of resources. It eliminates the manual switching mechanism employed by the farmers to ON/OFF the irrigation system. This project can be extended to a certain way that through AI the system will automatically detects the errors in the field and controls the field accordingly without being observed by the person at the home.

6. ACKNOWLEDGEMENT

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