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IoT Based Smart Farming

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Abstract- Agriculture is the key factor to satisfy the economy of our country and it is one of the basic needs of the human resources. Watering the plants is very important in agriculture. By using recent and current technologies irrigation system can be upgraded with the help of sensors and Microcontrollers. Thus, this irrigation system can be groomed and upgraded into an automated process.

Keywords: Irrigation, Water level sensor, GSM Module, Arduino-UNO.

I. INTRODUCTION

Agriculture is the backbone of our country. Our country mainly depends upon the agriculture and it satisfies one of the basic needs of the human resources. Agriculture contributes a prominent percentage in the GDP. In India, the most of the land spaces are use for the process of agriculture. Thus our country's growth mainly depends upon the agriculture. Agriculture should be continuously monitored and to ensure that it has been developed appropriately as it contributes a lot and the technologies should be upgraded in this agricultural area. It is mandatory to upgrade the technologies which in turn increases the production which reduces the demands of the basic needs of the human resources. In manual operation when there is scarcity of water, if water gets wasted it leads to undesirable situation. It is used to avoid wastage of water by sensing the quantity of moisture present in the agricultural land and it also helps in healthy growth of the plants by continuous monitoring. This irrigation system minimises the manual intervention by the farmer with the use of automated irrigation system. It determine the level of the water in the tank and to irrigate the land at the necessary condition .and also sends the information to the farmers whenever their agricultural land gets automatically irrigated. [1]More numbers are farmers are involves in the process of agriculture. This mainly helps in reducing the number of farmers working physically and to make it self operated. Different determining sensors are being used and it is done with the help of microcontroller. The microcontroller controls the operation of the pump. [2] The technology is getting developed rapidly which in turn minimises the risks and the threats involved in the process.

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This automated irrigation system controls water supply for the irrigation land automatically with the help of Arduino. [3]This automated irrigation system automatically irrigates the land mainly with the help of microcontroller.
The inputs given by the sensor to the other systems makes the agricultural land to be appropriately irrigated .It also helps to pass the information about the irrigation automatically to the farmers.

[4] This irrigation system mainly aims in converting the process which involves the manual work of the labours to the process that runs automatically. This can be achieved with the help of different types of sensors that are being used.[5]. The smart farming reduces the work of the farmers. This Smart farming using RF module project makes the process completely automated by operating the motor depending on the inputs received by the relay. It also conveys the information regarding irrigation process to the farmers. [6] Irrigation system is being designed with the help of Internet of Things. This concept is mainly used to convey the information to the farmers. The water level is also been determined in the water resource for the agricultural land. Smart irrigation mainly aims in upgrading the technologies in the field of agriculture and it make the process to be completely automated.

II. ISSUE IDENTIFICATION

In the current scenario, many people fails to irrigate their plants periodically. This mainly may affects the growth of the plants , hence to avoid these problems, the only solution is to make the irrigation process to be automatically operated. Thus, this smart farming is a system that automatically irrigates entire agricultural land and and it also delivers the message to the farmer. It also helps the farmer to know about the level of water in the water reservoir . Smart farming also determines the level of moisture present in the agricultural land. Smart farming also helps to identify the atmospheric conditions in terms of temperature and humidity .

III. PROPOSED SYSTEM

Smart irrigation system is completed operated with the help of the microcontroller (Arduino-UNO) . Various sensors like water level sensor , temperature and humidity sensor and moisture sensor are connected to the microcontroller. Then the arduino is further activated by the inputs received from these sensors. Once the inputs are received from the sensors, then the microcontroller gets activated. The microcontroller analyses the different scenario and start to operate accordingly. This microcontroller further sends the signal to the motor that whether it should be turned on or not according to the atmospheric conditions. The sensor which is placed inside the soil determines the condition of the soil and the output is given in voltage.

Then it compares the output voltage with the reference voltage. If the reference voltage is higher than the soil condition which is the output voltage , then the microcontroller passes the signal to the relay and this relay turns on the motor there by the agricultural land gets automatically irrigated . In the other scenario , the relay does not passes the signal and it remains in off condition, therefore the motor does not gets operated.

Microcontroller converts the analog signal, which is obtained from the soil moisture sensor into a signal which is digital in nature. The code is fed into the Arduino- UNO thereby the relay circuit gets operated by the input signals received by the relay. Thus depending upon the signal, then the motor gets operated. The motor will be in OFF condition when switch of the relay is opened and thus the motor will not get operated. Temperature and Humidity sensor will sense the humidity and temperature level in environment. If the temperature in the environment is high, then the agricultural land is needed water. The values are programmed in Microcontroller for temperature and humidity sensor values. If the temperature is low, the motor gets turned OFF and gets turned ON when the soil is dried.

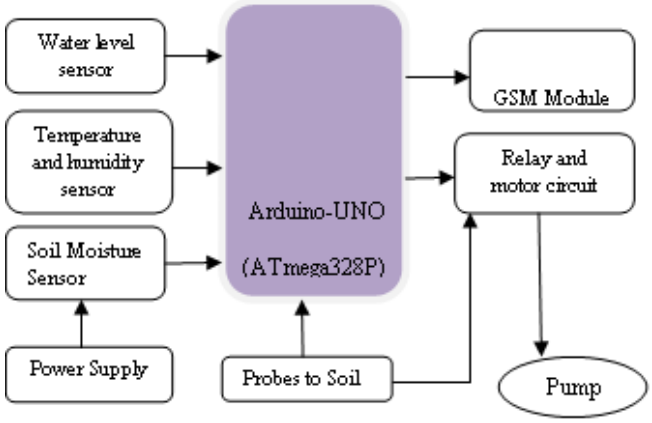

fig.No:1 Block Diagram

Fig No: 3 describes the soil moisture sensor. This moisture level sensor acts based on the resistance. If the If the environmental temperature is in the normal condition, the sensor senses the temperature and the analog signal is given to Microcontroller. This Microcontroller turns ON the motor for normal condition and the water is irrigated to the plant. Water level sensor will also be kept in the well or tank, which is the main source of irrigation. The water level in the tank is sensed with the help of water level sensor. In normal condition, the water level in the tank is higher.

If the level of water in the tank is very low, the alarm signal or message signal of the water level is given to the user or farmers. This is very useful for the user about the water level indication. The analog signals are given to the Microcontroller and these are checked under the condition, which was given and the digital outputs are connected to relay, which will be operated which makes the pump to be turned ON or OFF When pump turn ON, based on the control signal given, then the switch of the relay is closed and the water will be provided to plants when the motor gets turned ON. The control signal is to given supply which will turn OFF the motor. The required amount of water will be provided to plants, which is programmed in Arduino. When motor is turned ON, GSM provides the information to the user. The GSM, that is used here was will send the message to the user, so that the user can know the condition of the motor whether the motor is turned ON or OFF. This will indicate the temperature and humidity level in the atmosphere.The Bluetooth module is used in the system. Bluetooth module is used to store the data in offline condition. The Bluetooth module used in the system can store the messages about the motor ON and OFF condition.

When the soil moisture sensor, which will sense the water in the soil, if moisture in the soil measured is less than the specified value, then the motor will turn ON and this message is given to the user via Bluetooth module. This Bluetooth module gives the information of motor ON and OFF condition and temperature and humidity sensor values of the surrounding. The ESP- Wifi module used in this system is used to store the information in the cloud. This indicates the modern technology which is available on the cloud. Whenever the information is required for the user, they can take the information from the internet. The data's are water level, temperature and humidity level are stored in the application. This Wifi module will represents the temperature and humidity values in the surrounding will be provided as a form of graph. The simulation result is used to store the data and when it is needed for the farmer, it is very useful to know the previous irrigation result. The application consists of information about water level in the tank, temperature and humidity level in the environment and the motor status whether it is turned ON or OFF is shown in the application. These information are very useful to the user about the irrigation system given to the plants.

GSM: With the help of GSM, the information regarding the ON and OFF state of the pump can be sent to the user. The message is transferred to the user with the help of GSM module, which uses the TDMA technique. Global System for Mobile Communication was used for mobile communication. Relay: These relays acts as switch which opens and closes whenever it is needed The relay plays a major role in the irrigation system since it provides the necessary information for the operation of pump whether the pump has to be turned on or not..

Pump: The rotational movement increases the pressure of the water in the tank or well. Due the pressure it takes the water from the well and it is used in the agricultural land.Pump consists of a motor which converts the electrical energy to mechanical energy..

fig.No:2 Arduino UNO

Fig No:2 describes Arduino UNO. Arduino plays a Microcontroller in the irrigation system. These digital output signals were connected to relay. The output is again provided to GSM Module. These digital outputs are generated from the program which is already given to the Microcontroller. The output of all the sensors was provided as the analog inputs to the Arduino. This Microcontroller converts analog inputs into digital outputs.

resistance value is low this shows the high moisture content in the soil. If resistance is high this shows the dryness of the soil. This signal is given to the Microcontroller and this makes the relay to get operated. Soil Moisture sensor senses the moisture level in the soil.

Fig.No:3 Soil Moisture Sensor

Fig No:3 determines volumetric water level present in the property of soil.The connection between measured value and moisture of the soil should be calculated. This may vary based on the atmospheric conditions such as heat present in the atmosphere, moisture content present in the soil and conduction particle present in the soil.

Fig No:4 determines the level of water in the tank. Water level sensor measures the amount of water present in the soil. The minimal level of water level sensor is given as reference value. If the water level in the tank reaches below the minimal value then sensor gets activated.

Fig.No:4 Water Level Sensor

Fig No:5 detects the temperature and humidity values of the atmosphere. If the value is reaches the specified value then the temperature and humidity sensor gets turned turned ON. The principle behind water level is based on optical values. These type of sensors are used in modern application having the advantage of good sensitivity.It can be able to withstand very high heating temperature.

Fig No:5 is a minimal cost of measuring both temperature and humidity sensor. This sensor requires 5V to operate. The humidity sensor measures upto 90% of moisture values. The temperature range measures upto 50°C. Temperature and humidity sensor has communication pin, ground pin, supply pins.

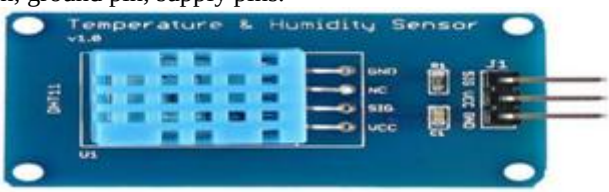

Fig.No:5 Temperature and Humidity Sensor

IV. CASE STUDY

Depending upon the type of soil, agro conditions, planting methods,manures and fertilizers and requirement of water of the sugarcane varies. If the weather is hot and cause of dry winds the water requirement will be more. If the crop sown requires less quantity of water but due to type of soil and the use of fertilizers the water requirement will be high. For a sugarcane, 1 ton of 150cm thick needed 60-70 tons of water with planted canes of 200cm with rainfall of (200-75)cm. The crop should be irrigated when water level reaches 50%. The soil should have good amount of moisture content while seeding. At beginning the irrigation should be done when plant is germinated about (20-25)% or having more than 20 days after seeding. During summer the interval is (10-15) days. During winter the interval is (25-30) days. During rainy season if there is drought the crop will be irrigated. The requirement of water will be more during tillering stage and elongation growth phase.If the water is logging the root respiration becomes poor, nutrients are leached out, the micro-organisms will reduce and the crop will have excessive branching. So it is necessary to drain excess water from the field.The average water requirement for sugarcane is (1800-2200)mm for the duration of 365 days with 24 irrigations.

V. RESULT AND DISCUSSION

IoT based Smart Farming is used in cultivation of crops. The water content of the soil is measured using soil moisture sensor and this sensor gives the input to the Microcontroller. The outputs given from the water level sensor and temperature and humidity sensor is fed as inputs to the Microcontroller. Based on the inputs given the Microcontroller makes the motor to get turn ON and turn OFF. The user also receives the message whether the motor is turned ON or turned OFF.

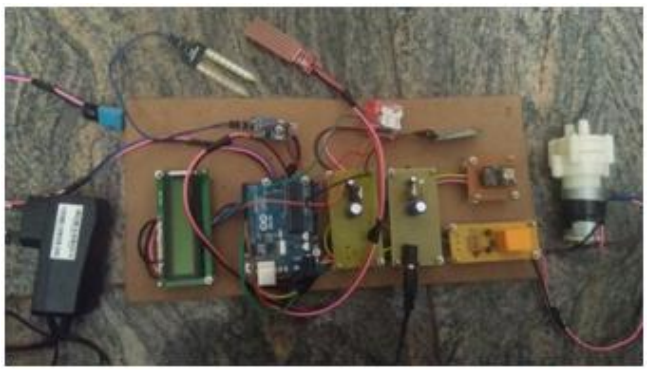

Fig.No:6Experimental setup

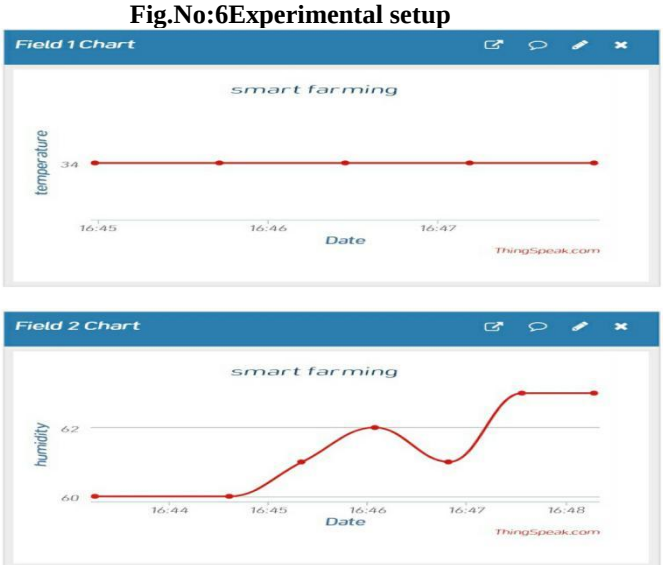

Fig..No: 7 Simulation result

VI. CONCLUSION

IoT based Smart Farming is mainly used to reduce the amount of water is wasted in the irrigation field and it also reduce the human intervention in the irrigation field. This system makes the motor to get turned ON and turned OFF automatically.

The plants get sufficient amount of water based on the temperature and humidity contents present in the soil. The growth of plants can be monitored easily. Human intervention in this process is completely reduced which make this method economic too.This system provides information about the motor ON and OFF condition to the user by normal message using GSM Module. This system also provides information about temperature and humidity about the environment using the application. This system reduces the human work about the irrigation is done to the plants.

REFERENCES

1. Aman Bafna, Anish Jain, Nisrag Shah and Rishab Parekh, "IoT Based Irrigation using Arduino and Android on the bases of Weather Prediction", International Research Journal of Engineering and Technology, Vol 05 Issue 05, 2018, pp. 433-437
2. Kim. Y, Evans. R. G, Iversen. W.M, 2008 'Remote Sensing and Control of an Irrigation System using a Distributed Wireless Sensor Network', IEEE Transactions on Instrumentation and Measurement, Vol. 57, No.:8, pp 1-6.
3. Dhivya A, Infanta J, Chakrapani K, 2012 'Automated Agricultural Process using PLC and Zigbee', Journal of Artificial Intelligence, Vol.5, No.:4, pp 123-130.
4. Satyanarayana G. V, Mazaruddin S. D, 2013 'Wireless Sensor Based Remote Monitoring System for Agriculture using Zigbee and GPS', in Proceedings of Conference on Advances in Communication and Control Systems, pp. 110-114.
5. DewesgvreeRane, 'Review Paper based on Automatic Irrigation System based on RF Module', International Journal of AICT, Vol.1, No. 9, January 2015.
6. A Goap, D Sharma, AK Shukla, CR Krishna ,2018, 'Smart Irrigation System', Computers and Electronics in agriculture 155, 41-49, 2018

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