International Journal of Recent Trends in Engineering & Research (IJRTER)
Conference on Recent Trends in Electrical and Electronics Engineering (RTEEE '19)
Special Issue; March- 2019 [ISSN: 2455-1457]
DOI: 10.23883/IJRTER.CONF.20190304.018.D1ABM

SMART AGRICULTURE: ENHANCEMENT IN CROP PRODUCTION THROUGH INTERNET OF THINGS (IOT)

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ABSTRACT
The rush in worldwide population is making us to shift towards smart agriculture. The reason behind this change is demolishing of natural resources, reduction in the availability of land for agriculture, the change in unpredictable weather condition makes production in agriculture a major concern for many countries. As a result, the Internet of Things (IoT) is used to enhance the production in agriculture sector. Internet of Things (IoT) is used as a major driver for smart agriculture. The combination of various sensors such as water level sensor, Humidity sensor, temperature sensor, soil moisture sensor, pesticide sensor, fertilizer sensor are used to detect the maximum possibilities to enhance the crop production and smart agriculture. Furthermore we provide future trends, innovation and application scenarios to make crop production to its maximum and eliminate the problem of food security,

Index Terms: Agriculture, Internet of Things(IoT),Sensors, Smart agriculture, production

INTRODUCTION

India is the country of village and agriculture plays an important role for development of country. In our country, agriculture depends on the monsoons which has insufficient source of water. So the irrigation is used in agriculture field. In Irrigation system, depending upon the soil type, water is provided to plant. In agriculture, two things are very important, first to get information of about the fertility of soil and second to measure moisture content in soil. Nowadays, for irrigation, different techniques are available which are used to reduce the dependency of rain. And mostly this technique is driven by electrical power and on/off scheduling. In this technique, water level indicator placed in water reservoir and soil moisture sensors are placed root zone of plant and near the module and gateway unit handles the sensor information and transmit data to the controller which in turns the control the flow of water through the valves. For continuously increasing demand and decrease in supply of food necessities, it's important to rapid improvement in production of food technology. Agriculture is only the source to provide

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this. This is the important factor in human societies to growing and dynamic demand in food production. Agriculture plays the important role in the economy and development, like India. Due to lack of water and scarcity of land water result the decreasing volume of water on earth, the farmer use irrigation. Irrigation may be defined as the science of artificial application of water to the land or soil that means depending on the soil type, plant are to be provided with water. The primary focus of this project is to help the farmers and reduce their work. This module can be implemented in perennial plant irrigation land and gardening land.

EXISTING SYSTEM

The economy being highly based on agriculture demands innovative and reliable methods of irrigation. The shortcomings of manual methods of irrigation can be rectified using automated process. Existing idea of automatic irrigation method and the following research sustains this idea. The task of automatic irrigation is done through assistance of soil moisture sensors. A part from soil moisture sensor. Humidity and temperature sensors are also used to make the process more advance. The feature of GSM which makes this system wireless. The electricity required by components is provided through solar panels hence this liberates us from interrupted power supply due to load shedding. The water content is constantly judged and whenever moisture level of soil gets low, the system sends a signal to motors asking them to turn on. The motors automatically stop after soil reaches its maximum upper threshold value which is decided by user. Every time the motor starts or stops automatically, the user will get a SMS about the status of operation. The automaticity means that it turns itself on and off depending upon the soil moisture requirement. This automatic behavior of irrigation is achieved using different sensors which sense and tell the user if water is required or not and how much water will be enough for soil so that water wastage is also avoided. The errors which may arise when manual irrigation is used are also rectified for the most part using this method.

Block Diagram

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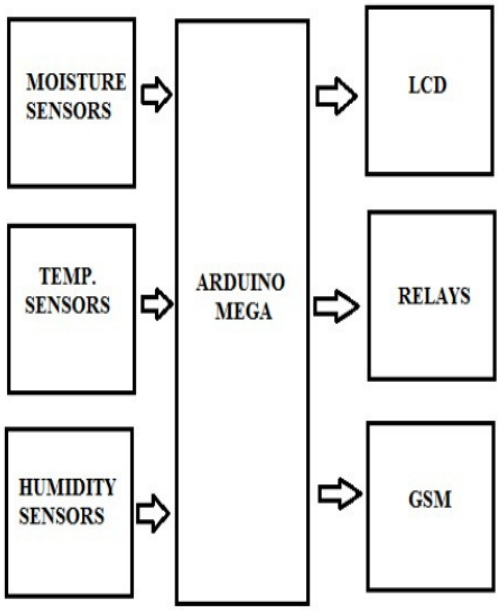

The basic working principle of the system is easy to understand. The system is divided into smaller circuitries. First one is solar circuit, it provides DC power to the components when power is needed by them. Second circuit is the sensor network. Moisture sensors are submersed into soil and connected back with the main system. The sensors give values of moisture content of soil and these values can be seen on LCD. Another circuit is the GSM module. This is also connected with Arduino and is responsible of sending information of every operation taking place to the user. In the code, there are basically two threshold values i.e upper and lower. The code carries these two values and are defined by user. The actual value of water content in soil is read by the moisture sensors which are submersed in soil. The code compares this value with the two user defined threshold

If actual value happens to be below than the lower threshold value, the code will generate a signal that will turn motors on. The process will be autonomous and the dried part of soil gets moisturized. The values of moisture level are constantly compared with the threshold values in code and if actual moisture value crosses the upper threshold value then again code will send the signal of turning off the motors. Fig.2 represents the basic flowchart diagram of this project. The process starts with sensors reading the value and displaying them on LCD. As the value of moisture falls below the lower threshold point, the motor starts and if the content climbs the upper threshold value the motors shuts off. In either case, user will get a SMS first of undergoing process. The status of motors is also displayed on LCD.

The other shortcomings include

- Many of the GSM technologies are patented by Qualcomm and hence licenses need to be obtained from them.
- In order to increase the coverage repeaters are required to be installed.
- GSM provides limited data rate capability, for higher data rate

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GSM advanced version devices are used.

- GSM uses FTDMA access scheme. Here multiple users share same bandwidth and hence will lead to interference when more number of users are using the GSM service. In order to avoid this situation, robust frequency correction algorithms are used in mobile phones and base stations.
- GSM uses pulse based burst transmission technology and hence it interferes with certain electronics. Due to this fact airplanes, petrol bunks and hospitals prevent use of GSM based mobile or other gadgets.

PROPOSED SYSTEM

Internet of Things (IoT) is widely used in connecting devices and collecting data information. Internet of Things is used with IoT frameworks to handle and interact with data and information. In the system users can register their sensors, create streams of data and process information. IoT are applicable in various methodologies of agriculture. Applications of IoT are Smart Cities, Smart Environment, Smart Water, Smart Metering, Security and Emergency, Industrial Control, Smart Agriculture, Home Automation, e-Health etc. 'Internet of Things' is based on device which is capable of analysing the sensed information and then transmitting it to the user. The farmers are still using traditional methods for agriculture, which results in low yielding of crops and fruits. So the crop yield can be improved by using automatic machineries. There is need to implement modern science and technology in the agriculture for increasing the yield. By using IoT, we can expect the increase in production with low cost by monitoring the efficiency of the soil, temperature and humidity monitoring, rain fall monitoring, fertilizers efficiency, monitoring storage capacity of water tanks and also theft detection in agriculture areas.

Block Diagram

Two sensors are placed in the crop, the data will be collected from that sensors these data in the form of analog values, so that analog value is converts digital values, the digital values are given input to Arduino that data sends to the database by using wifi, the sensors calibrated so that the minimum wet condition. The threshold voltage is varied according with different crop field in different seasons. The Microcontroller operated the relay, relay is also placed on that, when the data comes from the Sensors is that value is compare with microcontroller , [ ] value is

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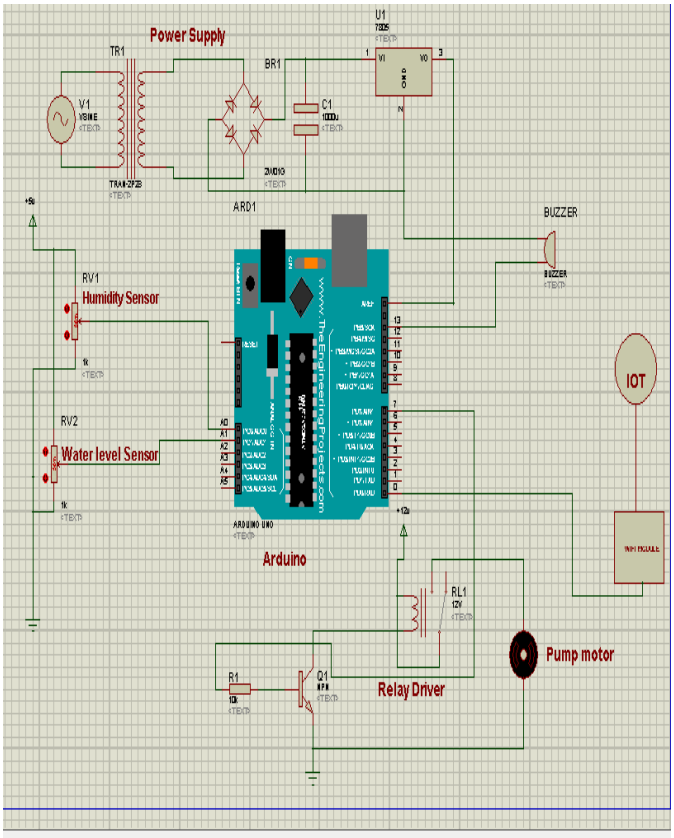
less than normal value so the field is dry conditions then signal send to the motor on, when the value is greater than normal value when the field is wet conditions. So that the signal send to the motor off automatically a buzzer is indicates change the condition when motor is "off state to on state" and "on state to off state". The data has store in cloud data by using wifi module. The system is completely automated and state of condition of the system can be known by check his mobile phone. Android App has been created, so these information the farmers identify the change that condition and in the microcontroller process using arduino code it generate the IP address all the sensors data is available in that address and also motor condition will also contains, at any place open the app by using mobile the data will display on our device.

ADVANTAGES

- Smart devices tend to decrease waste and increase efficiency which maximizes capabilities while minimizing cost.
- Smart irrigation systems can optimize water levels based on things such as soil moisture and weather predictions.
- The smart irrigation system will help you have better control of your landscape and irrigation needs as well as peace of mind that the smart system can make decisions independently if you are away.
- Local and commercial farmers can monitor multiple fields in multiple locations around the globe from an internet connection. Decisions can be made in real-time and from anywhere.
- Real-time insight and process automation through low cost sensors and IoT platform implementation

Implementation using IoT



This project uses concept of IoT for monitoring and controlling the system and ardu

ino and atmega processor is used as hardware components. A public server

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called MQTT server. It uses an android app called My MQTT. In this app, one has to subscribe a topic and publish a message of specific function. The server will call-back to perform the function.

MQTT

MQTT stands for Message Queue Telemetry Transport. It is a publish /subscribe, extremely simple and lightweight messaging protocol, designed for constrained devices and low-bandwidth, high-latency or unreliable networks. The design principles are to minimize network bandwidth and device resource requirements whilst also attempting to ensure reliability and some degree of assurance of delivery. These principles also turn out to make the protocol ideal of the emerging "machine-to-machine" (M2M) or "Internet of Things" world of connected devices, and for mobile applications where bandwidth and battery power are at a premium.

MQTT Architecture

MQTT has a client/server model, where every sensor is a client and connects to a server, known as a broker, over TCP.MQTT is message oriented. Every message is a discrete chunks of data, opaque to the broker.Every message is published to an address, known as a topic. Clients may subscribe to multiple topics. Every client subscribed to a topic receives every message published to the topic. MQTT defines methods (sometimes referred to as *verbs*) to indicate the desired action to be performed on the identified resource. What this resource represents, whether pre-existing data or data that is generated dynamically, depends on the implementation of the server. Often, the resource corresponds to a file or the output of an executable residing on the server.

CONCLUSION

The agriculture field is being monitored and controlled by android app at user end. The ESP8266 is the device at field end which receives the messages from broker network and manipulates it and will perform the function mentioned in message. After it will send the messages to broker network and in turn it will be published to the Client (user end). The ESP8266 is the best device for IoT projects. Since it is small, compact, lightweight, easily programmable, and easily installable and have enough GPIO pins to use them. Agriculture irrigation system is developed with low complex circuitry. A two sensors are used efficiently those are temperature and moisture of soil in the circuit to get the calibrated information to the system. Two sensors and microcontrollers of all three Nodes are successfully interfaced various Nodes. All observations and experimental tests proves that proposed is a complete to field activities, irrigation problems.

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Implementation of such a system in the field can definitely help to improve the field of the crops and overall production.

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