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SMART VILLAGE USING IoT

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Abstract - *The main objective of this project is to develop an automation irrigation system using an node MCU board with Internet being remotely controlled by any Android OS smart phone. So that agricultural lands are irrigates automatically without physical present of farmer. As technology is advancing so irrigations are also getting smarter. Modern irrigation pumps are gradually shifting from conventional switches to centralized control system, involving remote controlled switches. Presently conventional pump switches located in different parts of the agriculture land are makes it difficult for the user to go near them to operate and physically present on those areas. Even more it becomes more difficult for the elderly or physically handicapped people to do so. Remote controlled irrigation automation system provides a most modern solution with smart phones for those persons who want to do agriculture without physically present on the space.*

In order to achieve this, a IOT(internet of things) module is interfaced to the node MCU board at the receiver end while on the transmitter end, a GUI application on the cell phone sends ON/OFF commands to the receiver where loads are connected. By touching the specified location on the GUI, the loads can be turned ON/OFF remotely through this technology. The loads are operated by IOT board through relay module.

Along with this we use a soil sensor. Which detect whether soil is dry or wet. When soil condition is dry soil sensor give command to IOT module to start the pump. When soil becomes wet it gives command to stop the water pump. It works in accordance with the soil condition. This project is complete smart project for advanced irrigation.

An automated irrigation system for efficient water management and intruder detection system has been proposed. Soil Parameters like soil moisture, pH, Humidity are measured and the Pressure sensor and the sensed values are displayed in LCD. The intruder detection system is done with the help of PIR sensor where the birds are repelled from entering into the field. The GSM module has been used to establish a communication link between the farmer and the field. The current field status will be intimated to the farmer through SMS and also updated in the webpage. The farmer can access the server about the field condition anytime, anywhere thereby reducing the man power and time.

1. INTRODUCTION

Internet of Things represents a general concept for the ability of network devices to sense and collect data from the world around us, and then share that data across the Internet where it can be processed and utilized for various interesting purpose. Internet of Things is very quickly becoming a reality. We can see the proof of it around us. Our devices are getting smarter each day from smart phones to smart TV to smart car to smart kitchen. Everything is now getting connected to internet. Internet of Things describes a network of physical objects that connect to each other through the internet. Objects, or 'things' can transfer information wirelessly without requiring human interaction. A 'things' can be any objects that can be assigned an IP address and provided with the ability to transfer data over a network.

A thing, in the internet of things, can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has build in sensors to alert the driver when tire pressure is low or any other natural or manmade object that can be assigned an IP address and provided with the ability to transfer data over a network. These devices collect useful data over a network. These devices collect useful data with the help of various existing technologies and then autonomously flow the data between other devices. Current market examples include smart thermostat systems

and washer/dryers that utilizes Wi-Fi for remote monitoring.

Internet of Things or IoT is an architecture that comprises specialized hardware boards, Software systems, web APIs, protocols which together creates a seamless environment which allows smart embedded devices to be connected to internet such that sensory data can be accessed and control system can be triggered over internet. Also devices could be connected to internet using various means like Wi-Fi, Ethernet and so on. Furthermore devices may not needed to be connected to internet independently.

1.1 Aim and Objectives

The objectives of the project is to design a smart drip irrigation system to water plants with the use of devices like raspberry pi, Arduino microcontrollers. Arduino is used to control the system wirelessly while C/C++ programming language is used for automation purpose. This system also contributes an efficient and fairly cheap automation irrigation system. System once installed has no maintenance cost and is easy to use. Environment parameters monitoring system based on wireless communication technology has been developed to control remotely, which realizes the measurement of temperature, rain fall, soil parameters.

1.2 Existing Methodology

The system can be represented using algorithms and algorithms are designed using flowcharts

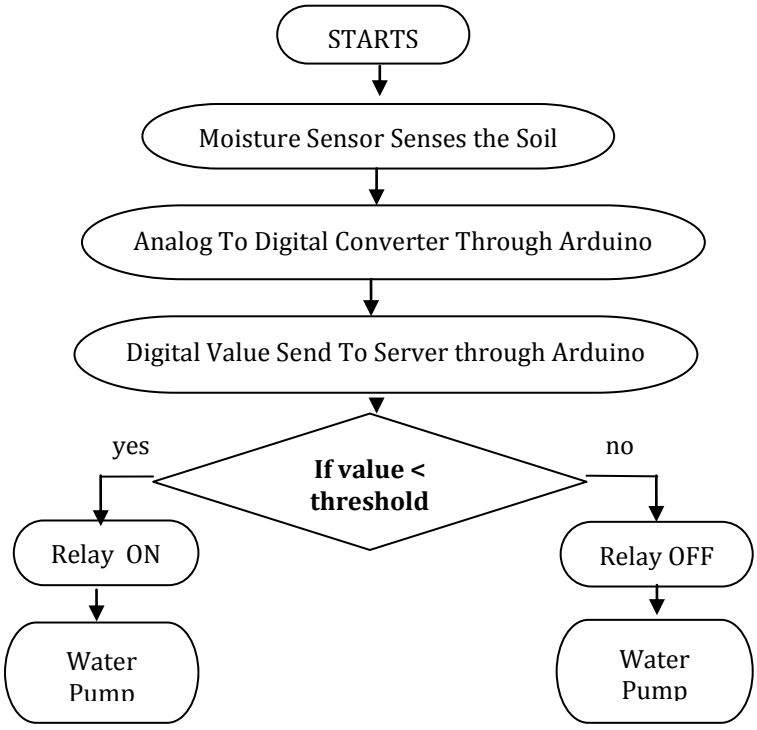

Figure: Flowchart of the system

The logics of the algorithm help to identify whether there is need of water to plant. Further, logics and decision making conditions help soil moisture condition of the soil and it always maintain moisture and also the user gets the status of the motor on the mobile. First the moisture sensor senses the soil. The output of the moisture is in the analog form. The ADC of the Arduino converts the output of the moisture sensor into digital form. The digital value is then send to the through RF module which decides whether to soil is wet or dry and according to that water the plant. If the soil is dry, Raspberry pi actuates the relay and water pump starts which leads to water to flow. If the soil is wet, turns the relay of as a result water pump is off and water flow stop

2. PROPOSED SYSTEM

An IoT based irrigation system is for efficient agriculture management system which enables farmers to contend with challenges they face. There are many application in IoT, which addresses the major problem like soil moisture detection, water conservation management, crop growth monitoring, etc. This project enables better and smarter irrigation through temperature, humidity and other sensors networked to communicate with the user. For farmers and growers, Internet of Things has provided extremely productive ways to cultivate soil with the use of cheap, easy to install sensors and an abundance of insightful data they offer.

SOIL MOISTURE: Soil moisture is the water that is held in the spaces between soil particles. The root zone soil moisture is the water that is available to the plants, which is generally considered to be in the upper 200 cm of soil, moisture is fundamental importance to many hydrological, biological and biogeochemical process. The proposed system include soil moisture measurement as the main module. Irrigation to the field and acknowledgement to the user are done based on the water content in the soil.

ELECTRICAL CONDUCTIVITY OF SOIL: Electrical conductivity(EC) is a measurement of the dissolved material in an aqueous solution, which relates to the ability of the material to conduct electric current through it. EC is measured in units called Seiments per unit area. Higher the dissolved material in the soil, higher the EC will be in it.

Similar to EC, pH of the soil measure the acidity of soil based on hydrogen ion concentration in it. The pH of the soil ranges on a logarithmic scale from 1-14, where pH 1-6 are acidic, pH 7 is neutral, pH 8-14 are basic. The optimum pH range for most of the plants is between 5.5-7. Based on the pH value the soil nutrient level can be defined.

TEMPERATURE: Temperature is another parameter that is measured in this project. This value helps in conservation of water used for irrigation. Even though the soil moisture is less, if the temperature is not too high then the irrigation to the crop can be limited. This is because many plants can withstand low moisture conditions when the temperature is moderate.

CONTROLLING UNIT: Arduino is an open source electronics platform based on easy to use hardware and software. Arduino boards are able to read inputs light on a sensor, a finger on a button, or a twitter message and turn it into an output activating a motor, turning on an LED, publishing something online. The board can be activated by sending a set of instruction to the microcontroller on the board. The Arduino programming language, and the Arduino software, based on processing must be used for implementation.

The moisture and temperature sensed by the sensor are processed in the arduino microcontroller. When the values are beyond the threshold value, then the controller does the defined job.

MOISTURE SENSOR: Soil moisture sensor measure the volumetric water content in soil. Since the direct gravimetric measurement of free soil moisture requires removing, drying, and weighting of a sample, soil moisture sensor measures the volumetric water content indirectly by using by some other property of the soil, such as electric resistance, dielectric constant, or interaction with neutrons, as a proxy for the moisture content. The relation between the measured property and the soil moisture must be calibrated and may vary depending on environment factor such as soil type, temperature, or electric conductivity.

Reflecting microwave radiation is affected by the soil moisture and is affected by the soil moisture and is used for remote sensing in hydrology and agriculture. Portable probe instruments can be used by farmers or gardeners.

TEMPERATURE SENSOR: The LM35 series are precision integrated circuit temperature devices with an output voltage linearly proportional to the centigrade temperature. The LM35 device has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient centigrade scaling. The LM35 device does not require any external calibration or trimming to provide typical accuracies of ¼ C at room temperature and ¾ C over a full -55 C to 150 C temperature range. Lower cost is assured by trimming and calibration at the water level. The low output impedance, linear output, and precise inherent calibration of the LM35 device makes interfacing to readout or control circuitry especially easy. The device is used with single power supplies, or with plus and minus supplies. As the LM35 device draws only 60 uA from the supply, it has very low self heating of less than 0.1 C in still air.

GSM SIM 900 MODEM: The GSM standard has given birth to wireless services like General Packet Radio Service (GPRS) and Enhanced Data For GSM Evolution (EDGE). Its end users were the first to take advantage for an inexpensive implementation of SMS, which is more popularly known as texting, GSM phones may be identified by the presence of a Subscriber Identity module (SIM). This tiny object, which is about as wide as a finger, is a removable smart card that contains a user's subscription information, as well as some contact entries. This SIM card allows a user to switch from one GSM phone to another. One service that has grown enormously is the short message service. Developed as part of the GSM specification, it has been incorporated into other cellular technologies. It can be thought of as being similar to the paging service but it is far more comprehensive allowing bi-directional messaging, store and forward delivery, and it also allows alphanumeric messages of a reasonable length. This service has become particularly popular, initially with the young as it provided a sample, low fixed cost.

This project effectively uses the short message service provided by GSM to acknowledge the user about the field and crop condition.

3. CONCLUSIONS

The moisture sensors and temperature sensor measure the moisture level (water content) and temperature of the different plants. If the moisture level is found to be below the desired level, the moisture sensor sends the signal to the Arduino board which triggers the Water Pump to turn ON and supply the water to respective plant. The system may be further extended for outdoor utilization

This project presents the design of an IoT based automatic irrigation system. The proposed system can reduce the efforts of farmers and provides high yield. It also conserves water for irrigation by locating the sensor at the right position above the soil level. This work have shown the plants can still sustain at low moisture level when the temperature is moderate.

The main goal of the project is to transform the manual irrigation system to the Automatic irrigation by using the Internet of Things (IoT). The machine can be operated through remote location so the farmer does not have to spend time in his field for irrigation in farm.

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