Designing Efficient Water Management Systems through Smart Irrigation Technologies

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ABSTRACT
Man has been exploiting water for irrigation. Since earlier period, necessary civilizations of the plant have developed on the premise of irrigation management. However here are heap of water wastage. Therefore, during this relevancy of conservation of water, we've planned a project using Arduino called Automatic Irrigation System that switches the pump motor ON/OFF on sensing the wetness of the soil. Plants reply to the relative lengths to lightweight and dark periods on the intensity and quality of sunshine. Artificial lightweight has been used extensively to regulate plant growth processes underneath varied conditions. Plants dissent within the want for lightweight, some thrive on sunshine, others grow in shade. An LDR could be a part that features a resistance that changes with the sunshine intensity that falls upon it. This permits them to be employed in lightweight sensing circuits. The sensing arrangement is created by exploitation to stiff metallic rods inserted into sector at a distance. Connections from the metallic rods or interfaced to the management unit.

Keywords: *IoT, NodeMCU, Zigbee, GSM*

INTRODUCTION

IOT interconnects humans to things, things to things and human to human. The notion of IOT is to bring out a huge network by combining differing types of connected devices. IOT has 3 aspects

Communication, automation, price saving in a every system. IOT empowers individuals to hold out routine activities. It avoids mistreatment of the internet and therefore saves time and value creating additional productivity. IOT allows the article to be perceived and controlled remotely across existing network model. IOT in environmental observance helps to grasp concerning the air and water quality, the temperature and conditions of the soil and conjointly monitor the instruction of the animals in to the files. IOT can even play a big role within the exactitude farming to reinforce the productivity of the plant growing mistreatment this designed detector networks to watch the condition of the plant. Detector area unit is accustomed to monitor totally different conditions of the atmosphere like water level, humidity, etc. This project uses NodeMCU as a man board, taking data from the sensors and will the work that is want by the plant. Internet application is employed to retrieve the information and show mistreatment BLYNK app that uses Wi-Fi module over net.

RELATED WORK

Smart agriculture can be implemented using various methods. Various techniques are discussed in this section. Each technique uses different processors, platform, architecture and communication modules having its own advantages and applications.

A. Automatic Control of Drip Irrigation System & Monitoring of Soil by Wireless
This paper developed the automation system that has a low cost equipment and alternative power supply to the motor pump like solar power or wind power. This system collects the data from the moisture sensor and the temperature around the plant's environment and sends that to the monitor through WLANs (Wireless Local Area Networks). When the water content to the soil is low, the motor pump automatically turns on and pours water to the plant until it reaches its maintenance level. Digital Camera is used to take photographs of the crop field to find the crop growth. They used ZigBee or Hotspot modules for wireless data transfer and receiving for control unit.

B. Automated Intelligent Wireless Drip Irrigation Using Linear Programming This paper proposed Automatic microcontroller based drip irrigation system. Here in this paper, the irrigation will take place only when there

will be intense requirement of water to the plant. They use valves to turn irrigation ON and OFF automatically. These valves may be easily automated by using controllers and solenoids. Also the linear programming helps to provide the proper management of irrigation and to achieve the best outcome (such as maximum profit or lowest cost). The main objective of designing this project is to save water, energy and man power in the agriculture. It is quiet costlier than the conventional irrigation system. Linear programming is applicable only to the problems where the constraints and objective functions are linear. In real life situations, when constraints or objective functions are not linear, so this technique cannot be used.

C. Micro Controller Based Automatic Plant Irrigation System

The author's aim is to develop the automatic drip irrigation system using micro controller. When there is change in the moisture of the soil then micro controller is interrupted by the sensors inserted in the soil. Using this method helps to prevent soil erosion and nutrient runoff.

The hardware used are Micro controller, ADC, Humidity sensor, Voltage amplifier, comparator current to voltage convertor, temperature sensor, solenoid, diode resistors and capacitors. The software used in this project is Multisim 10.2, dip trace. The advantage of the technology is using drip irrigation system which saves water usage for the plants.

D.GSM based Automatic Irrigation Control System for Efficient Use of Resources and Crop Planning by Using an Android Mobile

The author's aim is to check the status of moisture and temperature through GSM with the use of moisture and temperature sensors, water flow can be controlled by just sending a message from our mobile. Conservation of water and labour: Since they are automatic, they do not require continuous monitoring by labour. The system has a Bluetooth for remote monitoring so it reduces the problem of range with GSM network. The smoke sensors are used to send emergency information to user in case of fire in field or burning of motor.

The advantages are this is low power, low cost, robust and versatile. Thus, this system avoids over irrigation, soil erosion and reduces the wastage of water. Solar cells are used in case of power cut in the agriculture. The software is written in Java. Some of the basic applications include calendar, email, maps, making phone calls, accessing the Web browser, accessing your contacts list and others.

E. A Systematic Study on the Improvement of Irrigation System with an Automatic Water Flow Controller The author's aim is to reduce the production cost using the resources properly and monitoring the soil, sun radiation, water flow to the soil. It is used to check the atmospheric temperature by using LM35.The pyrometer is used to measure the radiation of the sun. The study reveals that the water requirement for irrigation is varied based of temperature of the atmosphere, moisture of the soil, sun radiation and rain fall. LM 35 is used to measure the temperature of the atmosphere. This system uses PIC controller, digital display units and converter circuits.

The moisture sensor is used to sense the moisture of the soil. The metal is inserted in the soil and the output of the moisture sensor is given to the controller. The controller produces output based on the sensor output. The moisture sensor is very essential for maintaining the soil temperature in the irrigation system.

F. A Low Cost Design & Monitoring of Automatic Irrigation System Based on Zigbee Technology

The author's aim is to provide water in all seasons by conserving the water for the next generation. The drip irrigation method is costlier and not easy to implement in the real-time. The ZigBee can cover around 30m at indoor and 100m at outdoor. In using Zigbee based automation circuit considerable amount of power saving is possible and it is flexible and compatible in future technologies.

To measure the water content in the air the humidity sensor is used, LCD is used to display the sensors output. Water level indicator is to measure the water level in the tank. Zigbee takes

low power and low data rate wireless system operates in three bands 2.4 GHz, 868 MHz and 915 MHz. The modulation used are OQPSK AND BPSK. It covers 10 meters and data rates are 250 kbps, 40 kbps and 20 kbps per band.

G. Design and Implementation of an Automatic Irrigation System Based on Monitoring Soil Moisture

This paper has been designed to facilitate the automatic supply of water from a reservoir to field. The objective of this work is to see how human control could be removed from irrigation and also to make the best use of water in the process. The soil moisture sensor continuously monitors the soil moisture level to decide whether irrigation is needed, and how much water is required in the soil. A pump motor is used to deliver the needed amount of water to the soil. This work integrates four subsystems namely; power supply, sensing unit, control unit and pumping motor which make up the automatic flow of water.

The advantage of this existing system includes saving water, conservation of water and labour. The author tested this project on three types of soil and analysed that sandy soil requires less water than the loamy soil whereas clay soil requires more water for irrigation.

H. Review Paper Based on Automatic Irrigation System Based on RF Module This paper proposed irrigation system depending upon the soil type and the amount of water is provided to the plant for irrigation .Here they used RF module which is used to pass the message and operate the system. Sensors have been placed in the farm to sense continuously and collect the information which is stored at centre monitor and transmits to the wireless sensor node. The author's aim for developing this project is to improve the irrigation system and to reduce the cost of irrigation water.

I. Automatic Field Irrigation Setup using MATLAB

This paper proposed automated field irrigation setup using the MATLAB. The main idea behind the development of this project is to reduce the supply of water to the field or to the plants. In this system, the microcontroller PIC16f877 will store the image of a healthy leaf and stores that in a SD card. The camera in the field captures the image of a leaf and sends it to the microcontroller via zigbee. The microcontroller compares both the images if any mismatch is found it will automatically pass the command to turn on the motor to supply water to the plant.

J. Automated Irrigation System using Solar Power

The author's aim is to design automatic irrigation system using solar power or panel that provides the sources for power supply to pump the motor to supply water the field or to the plants. When the water level in the plant goes down, the solar pump will automatically turns ON and irrigate the plants and goes OFF when it reaches its certain necessary level. The moisture sensor senses the soil moisture ration for turning ON/OFF the motor pump. Using the mobile app the user can monitor the plant moisture level. The advantages of using solar panel can reduce the electricity cost and it is weather dependent since it collects the energy during cloudy and rainy days.

K. Smarter Irrigation Using Wireless Sensor Network

The author's proposed smarter irrigation system using wireless sensor network (WSM). ARTIIC has two components automated real time controller (ARTC) and intelligent irrigation controller (IIC). It is used to analyse data and report to the central control system software. Using the WSM it can capture and store data in real time into a SQL Server database at a set uniform time interval. The IIC was developed to deal with issues that computes irrigation parameters then applies them in Application System. When the water level in the field goes down the motor pump will automatically opens the gates to supply the water. The WSM closes the water supply when it gets signal from the IIC. It can save significant amount of water and reduces the cost of labour.

L. Automation of Irrigation System using ANN based Controller

The author's aim is to develop the irrigation system using ANN (Artificial Neural Network)

based controller. It controls the irrigation time and controls the flow of water to plants. It also checks the growth of the plant and kind of soil. The wind speed is measured and radiation from earth surface is also measured and time relay module is also included. Stages for growth of the plants are also measured. The advantage of this project is that ANN approach will result in possible implementation of better resources and more efficient control. These controllers do not require a prior knowledge of system. It is worthy that ANN based systems can save lot of energy and water and can provide optimized results to all type of agriculture areas.

CONCLUSION

This is undeniably a resource which can make agriculture and home environment automated. It is more demanding and also useful for people who are busy and can't take much care of the plants. There are many other possibilities like creating complex connections of plants of similar variety or so- called Internet of plants. Also, one more experiment which can be done on this project is using another sensor and there are also other ideas like using solar power supply, timer for setting irrigation system etc. There is no doubt that this system can be very helpful in many ways. Before people used to avoid growing plants because they live in some apartments where there is no proper sunlight or they are so busy in their work that they cannot water the plants. But now, using this project people can grow plants without any worries. It is also possible to control the amount of water released for the process of watering the plant. Since the mobile app gives all the information regarding plant, people can know about the plant condition. Even though it is very helpful for general public, people who get more benefits from this system are agriculturists, craftsmen and botanists.

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