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Automated Plant Irrigation Using WSN Platform and Monitoring Over IOT

Aarti Thaware[1], Ankita Meshram[2]
Diksha Sahu[3], Jyoti Nikhade[4]
Nutan Nikhare[5], Ujwala Sarode[6]
[123456]UG Student Smt. Rajshree Mulak clg of Engg For Women
Department of Elect & TelecommunicationNagpur, Maharashtra, India
Smt. Rajshree Mulak College of Engg For Women vikram.deshmukh11@gmail.com
Nagpur ,Maharashtra, India
ankitameshram2707@gmail.com

Prof. Vikram Deshmukh
Assistant Professor
Departmentof Elect& Telecommunication

Abstract:- In agriculture, to optimize water use a system was developed known as an automated irrigation system .As we all known that for formers to run pumps and their motor for irrigation system government promoted a free supply of electricity to farmers.By providing these electricity it was found that the farmers makes the misuse of this promoted free electricity to run their home appliances, such as fans, T.V., etc. The main purpose of this project is to design automated irrigation system using a GPRS module and wireless sensor unit network.The project irrigation control using controller LPC2148 is designed to solve the difficulties on agricultural sectorThe system has temperature sensor which monitor different temperatures. The soil moisture condition of field is sensed by the dry /wet sensor .Depending on the soil moisture condition a submersible motor get switched on/off and status of motor can be displayed on the LCD .To check the flow, water level sensor is used .Using level sensors, water level in the tank is verified. To identify the rain in that place a rainfall sensor is arranged to update the information on web server about the field condition and IOT module is interface to the controller using GSM modem which is connected to the controller. The SMS is also send. To switch ON/OFF the motor a unique control of motor arranged by providing internet to android mobile. Through IOT module it is done.

Index Terms:-Sensors, General packet radio services (GPRS) , Internet of things(IOT), ARM 7, Wi-Fi, Automation, wireless sensor network(WSN).

I. INTRODUCTION

Our country India is still largely depends on agriculture. In agriculture field major portion of population is employed. These are ground surface and underground sources .These are lakes, wells ,rivers etc. on earth 97% is of water is in form of ocean and is saline water. For living being the total fresh water available for use is about only 2.6% and 0.6%. Thus limited water is present on earth to survive. The problem will be created for the coming next generation if the water is not properly utilized.Hence, it's time to conserve water using science and technology[1]. Water management is essential in agriculture as it use largest fresh water. For agriculture a wireless sensor network can be used to save water[2].As we know that in the system of traditional irrigation, farmers release the water manually to crops either by monitoring the moisture is soil or at regular interval and these is possible only for small farmland. Hence for these system laborsare required. So by automatic irrigation system the use of water will be reduce[3]. In this project, embedded system has been

proposed based on microcontroller. The system has soil moisture and temperature sensor placed in the plant at the root zone it means that the system has a distributed wireless network[4]. The information from the sensors are transmitted on web page, from which the user can control and monitor various parameter of irrigation system. The purpose of the implementation was to reduce water use[5].

II. AUTOMATED IRRIGATION SYSTEM

The Automated irrigation system mainly consist of two main component (Fig. 1), that is Wireless information unit (WIU) and Wireless sensor unit (WSU).

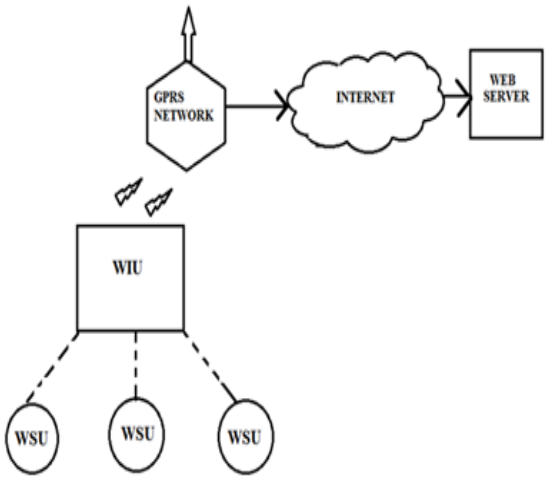

Fig.1 Configuration of Automatic irrigation system

Wireless Sensor Unit:-The station Wireless Sensor comprises with main component i.e RF transceiver LPC2148 Micro controller, sensors which are input such as soil moisture sensor, temperature sensor, Rain sensor, Water level sensor and water flow sensor, Relays, LCD display and power supply. In field a several WSU's are deployed where a distributed sensor network is form where each WSU consist of Micro controller. The radio modem, Wi-Fi processes information of soil moisture sensor, temperature sensor, level sensor, rain sensor and water flow sensor. In this unit the data from all the sensors is get collected on the Main Controller and by using LCD this data is displayed.

Wireless Information Unit:- The data from each WSU of temperature, water level, water flow, rain and soil moisture sensors are received , recorded, identified, and analyzed in the WIU. The WIU is mainly consisting of GPRS module, Wi-Fi and master Micro controller. This information are send on the web page which is in graphical form by using GPRS module. Hence this Graphical form shows the status of all the sensors.

III. SYSTEM ARCHITECTURE

A. Block Diagram

Figure 1.shows the block diagram of automated irrigation system.

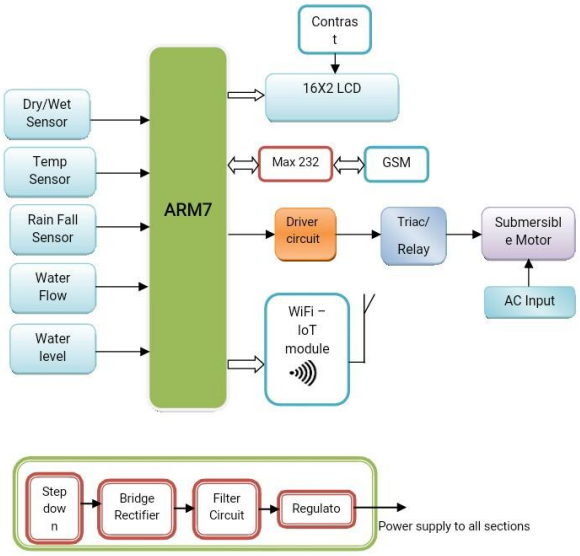

Fig.2 Block diagram of automatic irrigation system

B. Sensors

There are 5 sensors which are as follows:-

1) Temperature Sensor - The series of LM35 temperature sensor are precision integrated circuit shown in Fig. 2.1, whose voltage output is proportional to the Celsius temperature which is linear. Single power supply can be used with it. It operates at 4 to 30 volts. The LM35 operate at -55° to +15°C range.

Fig. 2.1 Temperature sensor

2) Level sensor - A device level sensor as shown in Fig. 2.2, which is used to determine the level of fluids, liquids or other substances. The level

measurements is either a point values or continuous.

Fig. 2.2 Level sensor

3) Soil Moisture sensor - A soil moisture sensor is used to test the moisture of soil as shown in Fig. 2.3. One can automatically water the plant by using this sensor by knowing the dry/wet condition of soil.

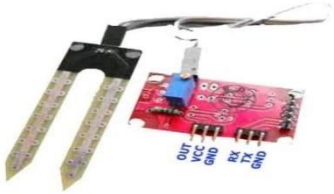

Fig. 2.3 Soil Moisture sensor

4) Water Flow sensor – As shown in Fig. 2.4,the device G 1/2 water flow sensor has plastic valve body, hall-effect sensor and a water rotor. The rotor rolls when the water flows through rotor. The working voltage of G 1/2 sensor is 5V – 24V.

Fig. 2.4 Water Flow sensor

5) Rain sensor – For rain detection a rain sensor module is used. It has raining board, it can be used as a switch when a raindrop falls on raining board and also for measuring rainfall intensity as shown in Fig. 2.5.

Fig. 2.5 Rain sensor

C. LPC 2148 Micro Controller

The micro controller LPC2148 is based on 16/32 bit ARM7TDMI-S CPU with embedded trace support and real time emulation which combines micro controller with high speed flash memory, ranges from 32kB to 512kB. It is manufactured by Philips. Due to their low power consumption and tiny size, LPC2148 is ideal for applications. A 128-bit wide memory and the architecture of unique accelerator enable 32 bit code execution at maximum clock rate. It is a single power supply chip. The operating voltage range of CPU is 3.0V to 3.6 V with 5V tolerant I/O pads. LPC2148 provide 8kB of on-chip RAM.

D. LCD Display

Liquid Crystal Display (LCD) is an electronic display module which uses liquid crystal to produce a visible image. LCD used in wide range of applications in electronics. The most commonly used LCD is 16×2 display. They are easy to program, cheap and wide range of characters and animations are displayed therefore LCD's are commonly preferred in display. A 16×2 LCD contain 2 display line each line displaying 16characters.

E. Wi-Fi module

Wi-Fi is a wireless local area technology, which is based on the IEEE802.11 standards device. The Wi-Fi allows the electronic device for connecting to the internet or to exchange data. Here the Wi-Fi is used to transfer the data from micro controller to the android phone.

F. Power Supply

In Full wave rectifier mostly it's output still is not suitable as a power suppy for most circuit since the output voltage varies in between 0v and v_s- 1.4 v, so if we put 12v AC input we will get 10.6v dc output. The voltage regulator is an electrical regulator it is designed to automatically maintain a constant voltage level. It may use an passive or active electronics component. It's depending on the design. It is used to regulate one or more DC or AC voltage.

G. Driver Circuit

A driver is an electronic component or an electrical circuit used to control the component or another circuit such as liquid crystal display, high

power transistor and numerous others. To regulate current flowing through a circuit or to control other components a driver is used. The driver stages of a circuit requires different characteristics for other stages of circuit.

H. Relay

It is an electrically operated switch. According to water requirement, relay is used here to switch the motor ON/OFF position. Relay contains coil which works on 12V power supply.

I. GSM

GSM is a Global System for Mobile Communication. It is a digital mobile telephony system. The GSM modem is interfaced with the LPC2148 micro controller Primer board for SMS communication to contact the user about the status of motor. For data scaring and control the SMS can be received and send. It operates either at the 900MHz and 1800MHz frequency band.

J. DC motor

A DC motor is a rotary electrical machines. It convert direct current electrical energy into mechanical energy. DC motor has a rotating armature winding and a permanent magnet or static field winding. The speed of DC motor can be controlled using either a variable supply voltage or by changing the strength of current in its field winding. According to soil condition the motor is ON/OFF. It is controlled from our relay boards or Micro controller using DC motor Drivers.

IV. OPERATION

ARM 7 Micro controller is interfaced with soil moisture sensor, temperature sensor, water level sensor, water flow sensor, WSN, LCD and water pump. First task is to initialize WSN and wait for a moment until it obtains a network. The green light indicates GSM is ON. State and red light indicates the network strength. Once it reach complete network there will be delay in blinking of red light. Then initialize LCD, after some time it will display all the statement gives in code such as title and also the status of field. Regarding pump and tank storage using the inputs from water level sensor and soil moisture sensor. We turn ON/OFF pump automatically when the moisture is present in the soil, soil moisture sensor senses the moisture presence it keeps the pump OFF and when it senses the absence of moisture it switch ON the pump and provides water supply to field. Then we need to continuously monitor all the sensors

Fig. 3 Automated Irrigation system for the experimental production.

and based on that we can take some actions. The level sensor is given to monitor the water level in tank whether it is high or low. By using a wireless sensor network and GSM module this whole process is automatic process of irrigation system. Rain fall sensor is used to monitor if rain is on that place or not. If there is rain fall in that field then there is no requirement of watering on that field.

Software application is a part of irrigation system which is manual process. This software application has two main options ON/OFF and status. The continuous monitoring of field and status is done by using GSM which can be used from any place. Here two activities are take place that is if the field is dry and the farmer switches ON the water pump it will inform to web server to switch ON and intimates by sending a SMS that water pump is ON state and if the field is in wet condition and switch the pump OFF and intimates pump OFF by sending the SMS. The farmer get the status of field whether the soil is dry or wet and tank storage is low or high by clicking on status. Framer will receive a message as water storage is high or low and tank storage is empty/full. The request for a web page is received by server, it inserts data to the agriculture field in the database. Remote watering can be performed. The GPRS consist of internet protocol stack or an embedded

transmission system control protocol. This include internet connectivity via UFL antenna connector and subscriber identity module socket. It interface to the micro controller which can transfer data at the rate of 115.2Kb/s. The power consumption is 5V with URL of the web server it establishes communication to upload and download data.

V. CONCLUSION

In all above discussion, the objective of this project is to avoid wastage of water and increase efficiency of irrigation. Automatic irrigation system is fully based on cell phone for irrigation to reduce manpower, soil erosion and nutrientleaching. The project is been implemented and designed with Micro controllerLPC2148. In automatic Irrigation system the sensors are interfacing with Micro controller. It also include Wi-Fi module and IOT system. By using GPRS, the continuous monitoring of the agriculture is done. Hence ultimately increase the profit.

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