

GSM based Remote Sensing and Control of an Irrigation System using WSN: a Survey

Nilesh S. Bhaltadak¹, Hemant T. Ingale², S.K. Chaudhari³

P.G. Student, Department of E&TC, Godavari College of Engineering, Jalgaon, India¹

Asst. Professor, Department of E&TC, Godavari College of Engineering, Jalgaon, India²

Asst. Professor, Department of E&TC, SSGB COE, Bhusawal, India³

ABSTRACT: Irrigation is the process of artificially supplying water to land where crops are cultivated. Traditionally rainfall, canal water and hand pumps are major sources of water supply for irrigation. Automated irrigation system which automates the irrigation of land by combining various software and hardware for field irrigation. Here WSN is used to monitor the environmental condition, wireless sensor network (WSN) refers to a group of sensors for monitoring and recording the physical conditions of the environments and organizing the collected data at a central location. This paper gives detailed survey of various automated farm irrigation systems. GSM serves as an important part also it is responsible for controlling the irrigation facility and sends them to receiver through coded signal.

KEYWORDS: Automated Irrigation, WSN, GSM.

I. INTRODUCTION

Irrigation is the process of artificially supplying water to land where crops are cultivated. Traditionally in dry regions having no or little rainfall water so on that time another way to supply water to the land through canal, hand pumps, tube wells. But this methods had lots of problems such as increase in workload of farm labor, leaching of soil lesser yield of crop. Hence there was a need to test the soil condition before supplying water to the fields. This mechanism would reduce workload of labor and helps to maintain the proper soil conditions for improved better crop production. Hence in the advance of technology it was possible to design systems that eliminated the direct involvement of farmer with respect to irrigation of their fields. These systems automated the entire irrigation system by controlling the motors that irrigated the fields.

A GSM based irrigation system has two major technologies, primary being the GSM and secondary is the controller. GSM (Global System for Mobile Communication) is a standard set used to describe protocols for digital cellular networks. This GSM facility plays important role for controlling the irrigation on field and also sending the results to the farmer via. sms, to a mobile device which indirectly controls the entire farm irrigation system.

The controller works as a central unit and its function is to automate the process after it has been initiated by the GSM based device, finally the presents output to the device. This paper contains detailed study of various GSM based farm irrigation approaches. In a day, a Bluetooth module is connected with the controller for simplifying the mobile device complications. In this paper we have study the advantages and disadvantages of various technologies.

II. RELATED WORK

The survey includes studying of various recent approaches of incorporating GSM technology and Bluetooth with mobile devices into a wireless adaption of the farm irrigation system.

This paper presents [1] a closed loop automatic irrigation system monitoring the temperature and water usage. The system can be used in greenhouse as well as open fields. The real time values of temperature, soil moisture are

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transmitted using zigbee technology through the wireless medium from field to substation which controls the motor and irrigation valves according to the desired moisture level. A flow sensor is connected to the main water supply which tracks the water applied to the field continuously. All the information i.e. temperature, current soil moisture level in field, upper and lower moisture levels maintained in field set by the user. The motor status, water uses and flow rate are displayed on LCD.

This system provides a automatic irrigation with the use of low cost sensors and the simple circuitry thereby it makes a low cost product, which can be brought even by poor farmer. The soil moisture level is one of the important parameter of agriculture, which controls the quality of crops grown in any type of field. The system monitors soil moisture and perform automated irrigation management. The temperature of greenhouse and water usage in Irrigation is monitored by system.

This system divided into two main blocks: a) Sensor Module
b) Substation

The sensor module and substation communicate to each other via wireless Zigbee network as shown in Figure1.

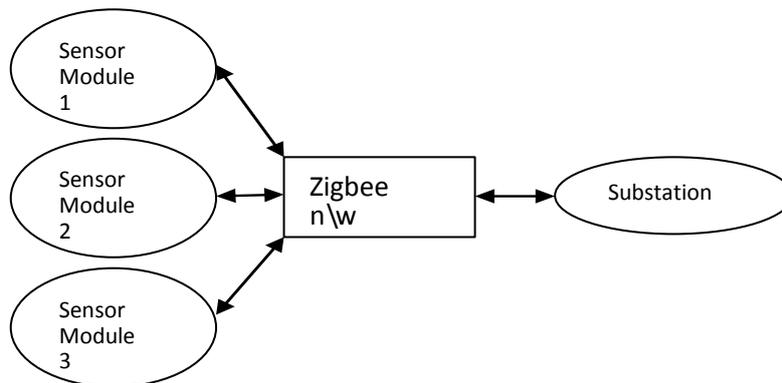


Figure1: Block Diagram of System

An automated agriculture pump system [3] can be used 12V programmable timer which will switch on the pump every evening at same time. Alternatively the electronic relay control board can be used together to supply power to the pump. The float switches can be used to detect water levels, also their readings fed into the electronic controller and it protects the pump from damaged if it runs out of water. The System is shown in figure2.

From figure the analog input are provided by IC1, an 8-bit analog to digital converter. There are 8 analog inputs for interface the analog sensors i.e. temperature, humidity, pressure etc. the analog to digital converter, converts the analog output of the multiplexer into 8- bit digital word. The microcontroller read the digital information from analog to digital converter (ADC) and controls the corresponding eight analog inputs and its send the data to PC RS232 port.

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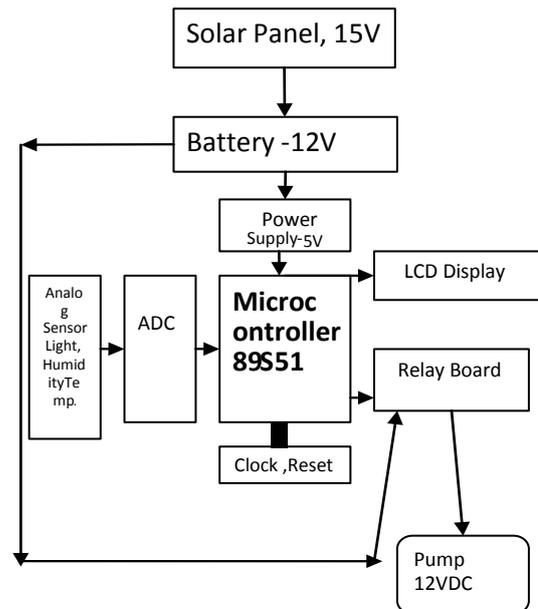


Figure2: Block diagram of system

In this paper [4] we introduce design of embedded web server by using GSM technology. In this system web server and node are connected wirelessly. The system is cheaper and more flexibility of the network topology. The separate GSM trans-receiver used for every node to transmit the details to server node. Irrigation control based on internet and microcontroller, in the farm we use water irrigation it is monitored by using sensor i.e. temperature, humidity. The sensor sense environmental condition and send this data to controller through the PC using GSM technology.

The automatic plant irrigator plays important role to increasing the productivity [5] of agriculture. This automated irrigation system based on the wireless sensor network with GSM-BLUETOOTH for control of irrigation and real time monitoring of agriculture. For real time monitoring of crops sensors are installed and these are controlled via SMS by using GSM module. This SMS shared via GSM/BLUETOOTH and interfaced with the main microcontroller. The microcontroller controls desired operation at the farm. This system also informs about temperature, soil moisture to the farmers by SMS via GSM BLUETOOTH module. According to this information action are taken by the farmer. The System is shown in figure3.

From figure the system includes an 8-bit microcontroller (Atmega64), Bluetooth module, GSM and RS232 interface. Here the microcontroller is interfaced with different sensors for monitoring the crops. The analog to digital converter converts the analog data into digital data. The EEPROM is used to records the data provided by sensors. This data is analyzed by the microcontroller and according to this analysis a SMS is sent to user mobile through GSM or Bluetooth. When the user sends an SMS requesting the status of devices and measured the value by the sensors, the GSM module sends the data stored in EEPROM as a response via SMS.

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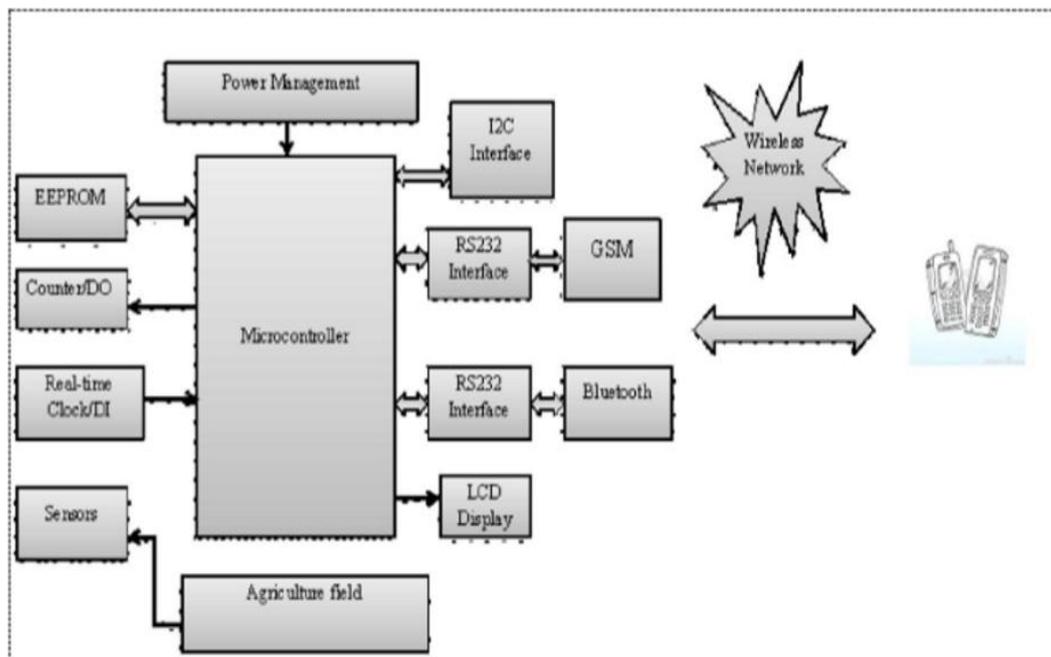


Figure3: Block diagram of automatic irrigation system using GSM-BLUETOOTH.

In this system whenever the [6] prescribed humidity or water level of soil decreasing below prescribed threshold level. For this purpose we use a humidity sensor and water level sensor. If the level of water increased above the prescribed level during rain, our system automatically lets the extra power and recycles them back to the water tank.

This system also senses the speed of wind to predict storm and natural calamities and warns to the farmer by sending SMS using a GSM modem. The temperature and fire sensors are used to alert the farmer on any kind of eventualities for safety purpose. The prescribed level of water varies depending on different crops and nature of the soil, here directly feed the type of soil & automatically set the water level. The farmer easily control and monitor the field using PC through Zigbee. The system is shown in figure4.

From figure the system includes GSM, Zigbee, microcontroller etc. The GSM is most popular standard for mobile phone. A unique feature of GSM is the short message service (SMS). The Zigbee travels across greater distances and handles many sensors. Here 8051 microcontroller is used to control the irrigation using wireless sensor network. A sensor is a device that measures physical quantity and converts it into electrical signal. For example humidity sensor, temperature sensor, water level sensor etc.

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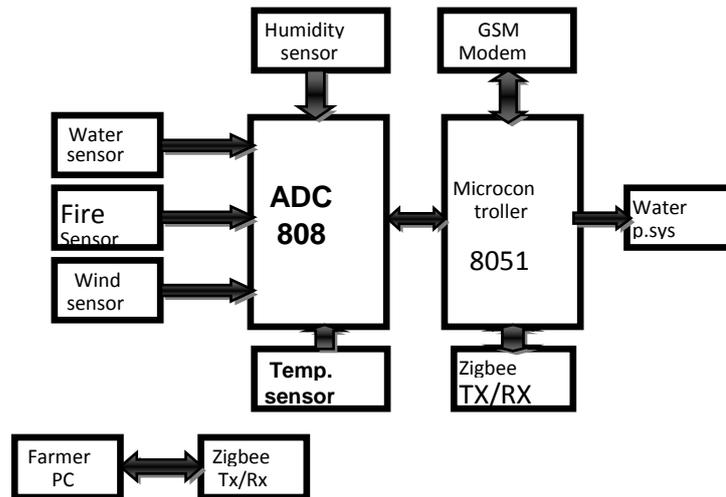


Figure4: Block diagram of system

In this paper [7] presents the GSM based irrigation control system, which gives the facility of maintaining environmental conditions uniformly. For this purpose android is used for mobile devices that include an operating system. The android provides the tools necessary to begin developing applications on android platform using the java programming language. The GPRS features of mobile are used in this application as a solution for irrigation control system.

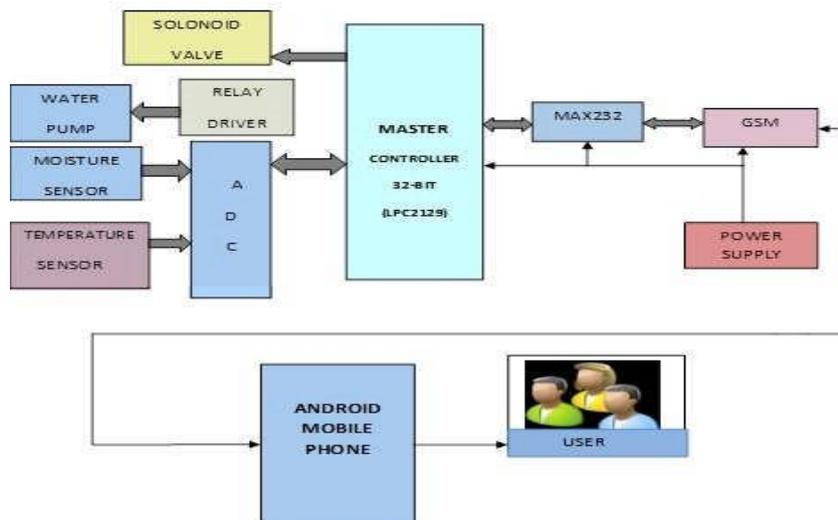


Figure5: Block diagram of the Irrigation Control System.

In this system the connection between two mobiles are done using GSM. The microcontroller and GSM module are connected using MAX232. The moisture sensor is used to sense the moisture of the soil if the moisture of the soil becomes low then it gives signal to microcontroller. The microcontroller sends this signal to called mobile then called mobile activates the buzzer. Therefore calling mobile calls, that buzzer is heard indicating the valve needs to be open.

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Simply by pressing the button in the called function then signal is given back to microcontroller. The microcontroller sends this signal to valves which causes it to get open. After certain interval moisture content of the soil increases then valve is off automatically. The power supply +5V are required for controlling system. The block diagram of system is shown in figure5.

III. CONCLUSION

In this paper we are presented a different approach of various different types of irrigation systems based on GSM. These systems were all remotely controlled systems which proposed a low cost information exchange via SMS and GSM. The result of the survey conducted has lead to a very positive approach on the impact of GSM technology in farm irrigation methods & techniques. Everyday new techniques have been implemented for minimizing the irrigation process like mobile phone and other software application for conduction of irrigation process. This leads to a better and more efficient agricultural development for the future generations to come.

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