Automated Irrigation system using Wireless Sensor Network

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Abstracts: **Automated irrigation system was developed to minimize water use for agricultural field. Deficiency in fresh water raised a big problem in last decade .This paper presents a smart system that uses a soil moisture sensors that provides a useful information about the soil and transmit this information to centralized server that control water supply. Generally we are using a MATLAB Programming to display threshold value and previous data in excel sheet. In this paper we are describing a 3 sensor i.e. temperature sensor , light sensor and soil moisture sensor that transmit soil data to authorized persons pc using XBEE.**

Keywords: Automation, wireless sensor network, Internet, cellular network.

I.INTRODUCTION

Agriculture plays a vital role in every countries economy .Generally agriculture uses 80 % of fresh water this percentage will be dominant in water consumption because of population growth so this becomes a very important to create a system which is based on science and technology for sustainable use of water .There are so many systems are available to achieve water savings in various crops from basic ones to more technologically advanced ones .In one system plant water status was monitored and it is based on canopy temperature of the plant, another system was developed to arrange irrigation of crop water stress index .This paper uses a low cost wireless device for data communication .An automated irrigation system is developed with a low cost moisture sensor .Another way to determine crop irrigation is estimated plant system .application using mobile devices is also available , it is used for calculating leaf area using image processing technique . A data acquisition system was developed for monitoring crop condition such as a soil moisture air and canopy temperature data were downloaded using a computer connected throw a serial port for analysis and storage .To achieve the effectiveness of water management another system is developed which is based on a WSN and weather station for internet monitoring of drainage water. The development of a WSNs based on microcontroller and communication technologies can improve the current methods Home applications is also based on a wireless embedded sensors for monitoring and controlling household devices .Also sensor network can be use for security purpose .In industrial environments for inventory management WSNs have been installed which provides

real time data acquisition .Industrial WSNs have been implemented to monitor fault diagnosis and monitoring of the temperature sensitive products.

In environmental application, sensors network have been used to monitor a variety of environmental parameters or conditions in marine, soil and atmospheric conditions. Application in agriculture have been used to provide data for appropriate management .Various commercial WSNs exist, ranging from limited and low resolution devices with sensors and embedded processors .In a wireless node ,the radio modem consumes more power .Recently there are too many wireless standard have been established such as local area network uses IEEE 802.11b(Wi-Fi) and wireless personal area network uses IEEE 802.15.1 (WPAN) ,IEEE 802.15.1 (Bluetooth) and IEEE 802.15.4 (XBee). In this paper development of an automated irrigation system based on microcontroller and wireless communication is presented. The aim of this implementation is to reduce the water use using an automatic irrigation system .In this implementation we are using a 3 sensors i.e. soil moisture sensor ,temperature sensor ,light sensor this 3 sensors are interface with PIC controller where we are transmitting the soil data to the PC using XBee transreciever and also we are using a motor for watering the field. 3 sensors are deployed in plant root zone .If soil is dry automatically motor will get on in this way soil moisture sensor provide quick information to the controller .Communication between the sensor node and data receiver is via the XBee protocol. This data is given to the PC via XBee and we are using MATLAB software for setting threshold value and creating previous data in excel sheet.

II. MOTIVATION

Agriculture is very important part of human life for that sufficient amount of water is needed but sometimes due to human ignorance some part of crop is not getting sufficient amount of water due to that percentage of production of crops reduces .The automated irrigation system provide use of water can be reduced for a given amount of biomass production and also reduces human power by automatically switching of pumps .The irrigation system can be adjusted to a variety of specific crop needs and require minimum maintenance. The modular configuration of the automated irrigation system can allows it to be increase for large green houses.

III. NEED

Today's world is digital .in this 21st century country needs automation and Agriculture is the main and vast field for our country's financial system .So we are trying to implement technology which is use for agriculture hence we are implementing automation Irrigation system so that we can reduce man power .Irrigation consist of a hand pump channel water computerized watering system. Irrigation is useful to supply water where large most of the crop is stored in large building.

IV. METHODOLOGY

A. Proposed Design

After studying literature survey and understanding need globally these papers are modified and a novel technique is build called Automated Irrigation system using WSN and GPRS module.

In this project we are using two unit 1) WSU Unit i.e. wireless sensor unit 2) WIU Unit i.e. Wireless information unit.

B. Hardware and Software Requirement

1. PC with MATLAB
2. ARM Controller
3. Temperature Sensor
4. LDR
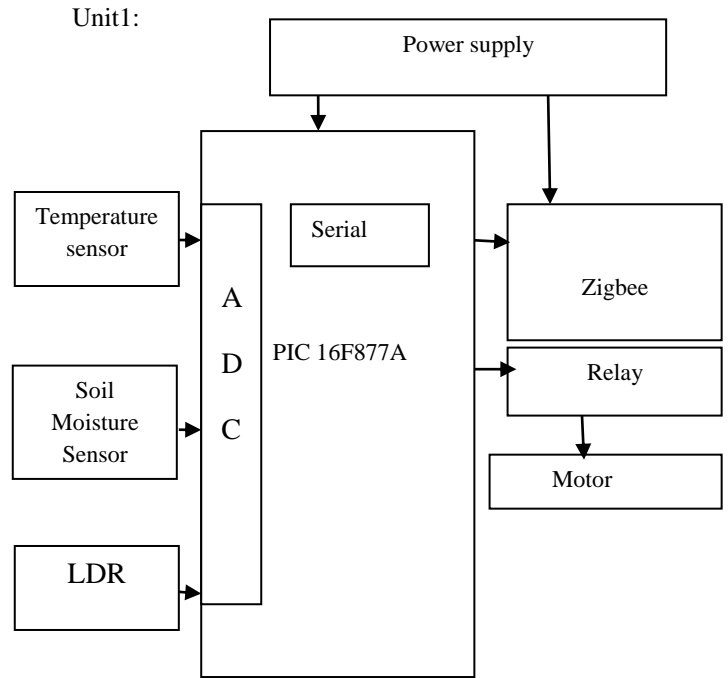5. Soil Moisture Sensor
6. Zigbee
7. Motor
8. FTP Server

Unit1:

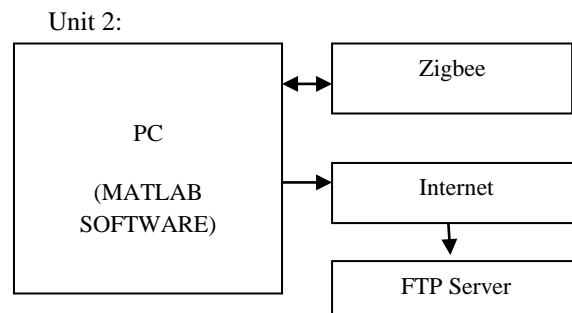Fig: - (1) WSU Unit (wireless sensor unit)

Unit 2:

Fig: - (2) WIU Wireless Information Unit

Automated Irrigation system:

The Automated irrigation system consist of two unit WSU i.e. Wireless sensor unit it is linked by radio transceivers that allowed the transfer of soil moisture data, temperature data and light data for this it uses XBee technology and we are using a GPRS module to transmit the data to a web server via the public mobile network. The information can be remotely monitored online throw internet access devices and using Wi-Fi network available in Smartphone.

Wireless Sensor Unit:

A WSU is consist of RF transreciever ,Sensors ,microcontroller and power sources .A low cost ,robust ,wireless sensor that provides long period of operability without maintenance. Wireless sensor is made to communicate with a base unit. When the sensor unit detects the condition like smoke, fire, water etc the sensors communicate with the base unit and provides data regarding the condition. The sensor unit receives instruction to change operating parameters and control external devices. Several WSU can be inserted into the field to configure distributed sensor network for the automated irrigation system.WSU unit consist of a PIC Controller, sensors, XBee module and Motor. We are using a three sensor temperature sensor ,soil moisture

sensor and light sensor these sensors are interface with PIC and with the help of a programming one can control Motor automatically also XBee is interfaced with controller that transfer the sensors data to the PC and FTP Server.

Wireless Information Unit:
This unit consist of PC ,XBee and Internet .Soil moisture ,temperature and LDR   data are received and process using MATLAB and this data are send to the other devices using internet throw FTP server.

C.Principle of operation
a. Working of a WSU Unit:
In this project MATLAB is used to collect data from WSU Unit and displayed all sensors data graphically .we are preparing code for that .in this project we are using 2 WSU unit i.e. Wireless sensor unit in which we are using ARM Controller to that 3 sensors are interfaced and one Motor is fit at the field side .Sensors programming has been done using a micro-C-compiler .in this way as soon as there is lack of water motor will automatically get start.
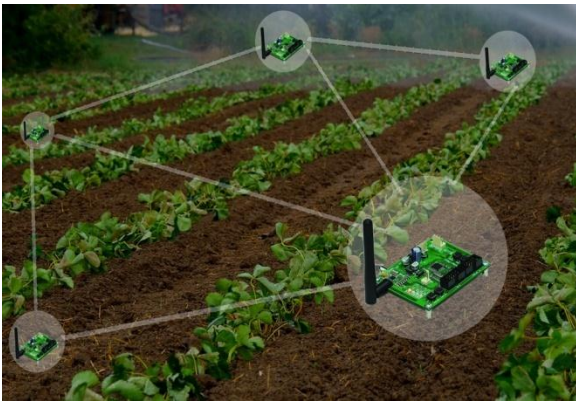T

Fig 3: WSU Unit present at the field site.

 In above figure we can see that there are too many WSU Units are available at the field site .This unit will works soon as there is lack of water and will start motor immediately.

c. Components used:
PIC Controller is used to control the motor .Motor is used to provide immediate water to the field. In this project we are using 3 types of sensors Temperature sensor i.e. LM35, LDR, Soil moisture sensor. Relay is also used for switching purpose. We are also uses Zigbee for serial communication which transfers sensors data to the PC and using MATLAB Software we are processing this data.
We are using PIC controller of type PIC16F877A this controller is easy to programmed .It is CMOS flashed based 8-bit controller .Its architecture comes in 40 to 44 pins package. It has a 256 bytes of EEPROM data memory, self programming.8 channels of 10 bit analog to digital converter.

V.SOFTWARE FLOWCHART

MATLAB Software allows uploading and execution of the code. Fig 4 shows software flowchart of proposed system
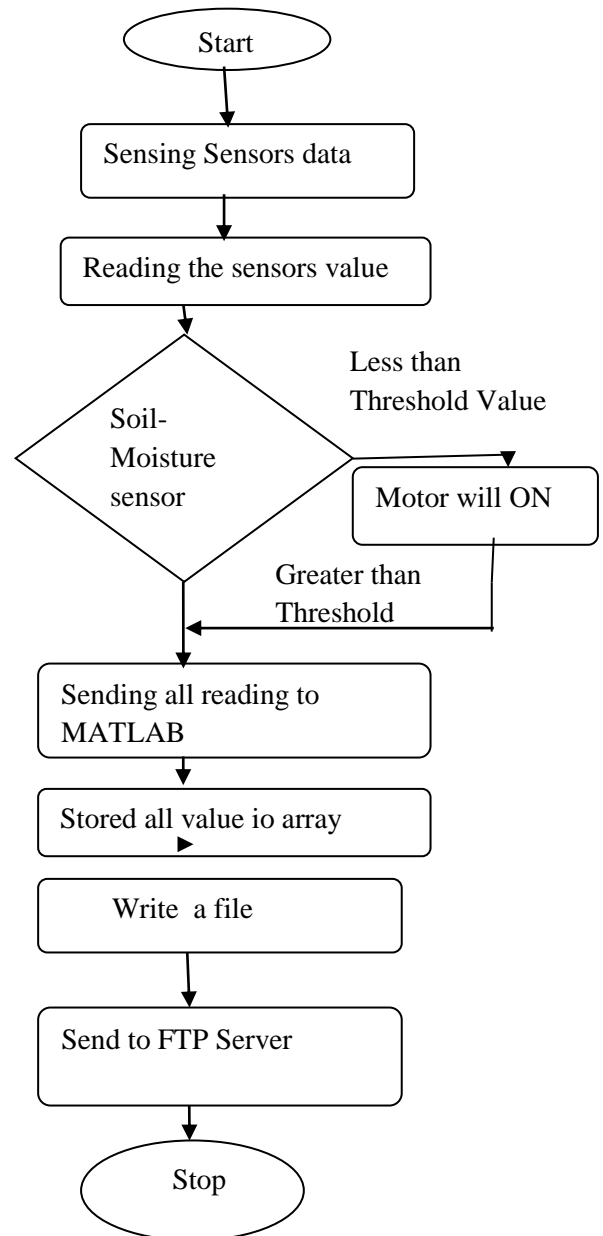

Fig 4: Software Flowchart

In above Software flowchart whole software process of the system is shown .In that MATLAB will receive data from Hardware with the help of Zigbee and sending this to the FTP Server.
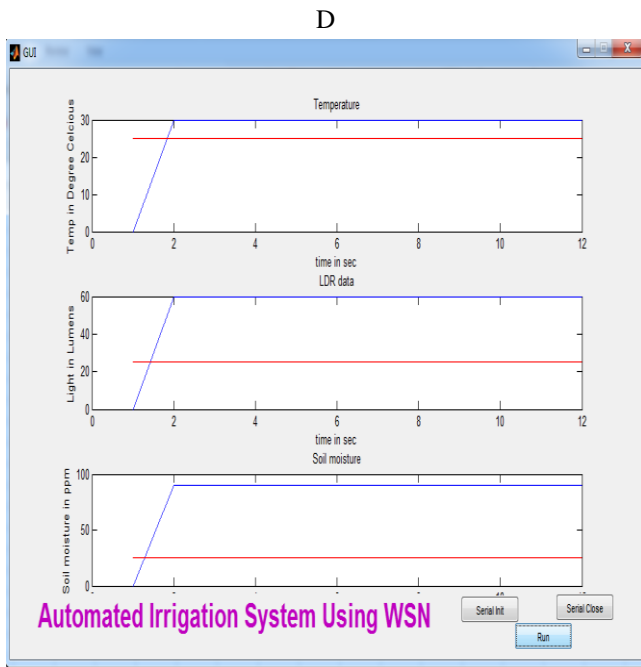
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Fig 5: Output when MATLAB Code calculating Sensors Value

Modification in the circuit:

By referring all the related papers of Automated irrigation system but by using MATLAB software in modified Irrigation system, this proposed Irrigation system is more reliable and high responsive .we have replaced Original WIU Unit i.e. Wireless Information Unit by PC in that we have used MATLAB Software where we are processing(Soil)data.

Data are received, recorded, identified and analyzed internally in Original WIU Unit because of that we had replaced this unit by PC.

This Irrigation system definitely helps to improve water management in agriculture production.

VI. CONCLUSION

The automated irrigation system is very important for optimizing water resources for agricultural production .This system help to monitor automatically so we can reduce man power and also it proves that use of water can be diminished for a given amount of fresh biomass production and also this irrigation system is use for large green house production.

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