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Implementation of Wireless Sensor Network for Real Time Monitoring of Agricultural Parameter

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Abstract: ***Present paper objective is to develop a smart wireless sensor network (WSN) for an agricultural environment. Monitoring agricultural environment for various factors such as soil moisture, temperature and humidity along with other factors can be of worth. A traditional approach to measure these factors in an agricultural environment meant individuals manually taking measurements and checking them at various times. This paper investigates a real time monitoring system using transmission control protocol/ internet protocol (TCP/IP) data logger. These nodes send data wirelessly to a TCP/UDP server, which sends data from various sensing parameterthrough GSM/GPRS and display on computer screen using graphical user interface (GUI).***

Keyword: AT mega 32 microcontroller, LCD, sensors, TCP/IP data logger.

1. Introduction

For the past few decades, Technology Developed for Architecture has been an emerging solution for monitoring agricultural farms over different locations and climatic conditions. However, technology Established had short range of communication. Real time monitoring and controlling the environmental parameter using TCP/IP data logger from anyplace in the world can suitably guide agricultural production and improve crop. The design presented has the advantage of TCP/IP technology.

A different method of monitoring and controlling for agriculture parameter has been used. Watering with hose and pipes will waste the water. Proper method of irrigation should have implemented to achieve an optimum water supply for productivity. We are using automatic irrigation by using drip irrigation with the atmga32 microcontroller which controls the operation. It seems that over watering by flooding will destroy farm field. We are monitoring the flood by using sensor positioned above the ground level. Message will be send if overflow increases to defined level.

For monitoring farm field GSM is required which find the location of farm and GPRS for communicate to the user receiver. This paper will save water and human work. Better technology has allowed farmers to feed more people and require fewer people to work farms to feed their families. This is very cost effective and its life is very large. Real time monitoring gives information about sensors condition and controls the farm. TCP/IP supports n/w traffic monitoring.

2. System Architecture

Agricultural depends on various agricultural parameter disturbances, this parameter changes the condition of farm and eventually causes problem in growth of plant result in lesser yield. Fig. 1 consists of different types of sensing unit.

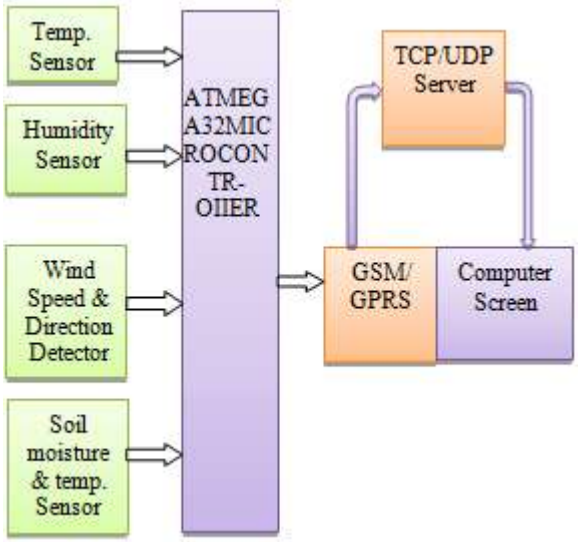

Figure 1: basic block diagram of system

Sensors note weather's various parameters. The readings then provide to the microcontroller which has in built 10 bits A/ D convertor. This convertor converts all analog data to equivalent digital form, displays the results on LCD and then sends to GSM Mobile. At GSM, by using mobile, various AT commands SMS can be sent to the user mobiles. At the same time, we can visualize the data on TCP/IP protocol suit through the IP address of the pc.

A) Design of WSN Hardware

AVR Processor

The high-performance, low-power Atmel 8-bit AVR RISC-based microcontroller combines 32KB of programmable flash memory, 2KB SRAM, 1KB EEPROM, an 8-channel 10-bit A/D converter, and a JTAG interface for on-chip debugging. The device supports throughput of 16 MIPS at 16 MHz and operates between 4.5-5.5 volts. By executing instructions in a single clock cycle, the device achieves throughputs approaching 1MIPS per MHz, balancing power consumption and processing speed.

TEMP Sensor
LM35 is a precision IC temperature sensor with its output proportional to the temperature (in C). The sensor circuitry is sealed and therefore it is not subjected to oxidation and other processes. With LM35, temperature can be measured more accurately than with a thermistor. It also possess low self-heating and does not cause more than 0.1 C temperature rise in still air. The operating temperature range is from -55°C to 150°C. The output voltage varies by 10mV in response to every C rise/fall in ambient temperature, i.e., its scale factor is 0.01V/ C.

Humidity Sensor
The SY-HS-220 series Humidity sensor is used in the present work. This is capacitive sensor widely used due to their special features like fast response, superior linearity, sensitivity and stability. This module converts relative humidity to output voltage. Its operating voltage is 5 V DC and its operating temperature is 0 - 60° C and its operating humidity is 30- 90 % RH. Its standard output at 25 °C and 60 % RH is 1980 mV DC.

Soil Sensor
For giving proper moisture level of soil to the plant will correctly increase the crop production. Sensor used here is based on resistive principle. The Soil Moisture Sensor is used to measure the volumetric water content of soil and produces the analog output of the water content in the soil.

Light Sensor
Increasing light will increase the temperature in the environment this will harm the crop which needs cool environment for this LDRs or Light Dependent Resistors are very useful sensor. Normally the resistance of an LDR is very high, sometimes as high as 1000 000 ohms, but when they are illuminated with light resistance drops dramatically. An LDR is a component that has a (variable) resistance that changes with the light intensity that falls upon it. This allows them to be used in light sensing circuits.

GSM &GPRS
We using SIM 900 GSM/GPRS module which works on frequencies 850/ 900/ 1800/ 1900 MHz the Modem is coming with RS232 interface, which allows connecting PC as well as microcontroller with RS232 Chip (MAX232). The baud rate is configurable from 9600-115200 through AT command. The GSM/GPRS Modem is having internal TCP/IP stack to enable to connect with internet via GPRS. It is suitable for SMS, Voice as well as DATA transfer application in M2M interface.

B. Software Details Embedded System
The present system is implemented by developing a suitable embedded C program based on IAR IDE. For programming of microcontroller ATmega32 buffer must load with .hex file. The hex file is created through Micro C development software. And for ATMEL controllers coding is done. Finally it provides the Intel format .hex file and this file then burn into IC through TOPWIN programmer.

TCP/IP Data Logger Software

Advanced TCP/IP Data Logger input TCP/IP data directly into Windows application. Advanced TCP/IP Data Logger provides real-time data collection from any device or instrument. Send and receive serial data across the Internet or network connection. it is based on an engine of our favorite product Advanced and therefore inherits all base features of this software and can work with all plugins for Advanced Serial Data Logger, but apart from Advanced Serial Data Logger that works with serial ports (RS232 or RS485) only Advanced TCP/IP Data Logger works with TCP/IP or UDP ports and sockets.

To activate this just need to select the IP Address and port number and specify the name of a disk file.

Key Features:

- Capability to log multiple TCP/IP ports simultaneously;
- Server/client operation modes;
- Variable format file forming setting (on time, data, size and etc.);
- Advanced data parsers that allows you to parse, filter and format your source data of various complexity levels;
- Data export to any ODBC-compatible database (MS SQL, Oracle, MS Access, MS Excel, dBase and others);
- Advanced TCP/IP Data Logger can use direct connection (using OLE) to Microsoft Excel and write data directly to rows or columns;
- Improved data formatting;
- Plug-ins support;
- Simple and intuitive setup wizard no programming required to start collecting data;
- Supports all Windows versions:9x/Me/NT/2000/XP/Vista

3. Experimental Results

Sensors and TCP/IP data logger areinterfaced through GSM SIM 900 kit microcontroller. The sensed parameters are converted into digital form by using ADC pin of microcontroller and displayed on JHD162A LCD display. The displayed parameters are also sent to the TCP/UDP server through GSM/GPRS and from TCP/UDP server it is monitored on computer screen by using graphical user interface and the data and time of each value is stored in log file created by the TCP/UDP system database. Fig 2 shows that various agriculture parameter are calculated and displayed in every 1s on screen.

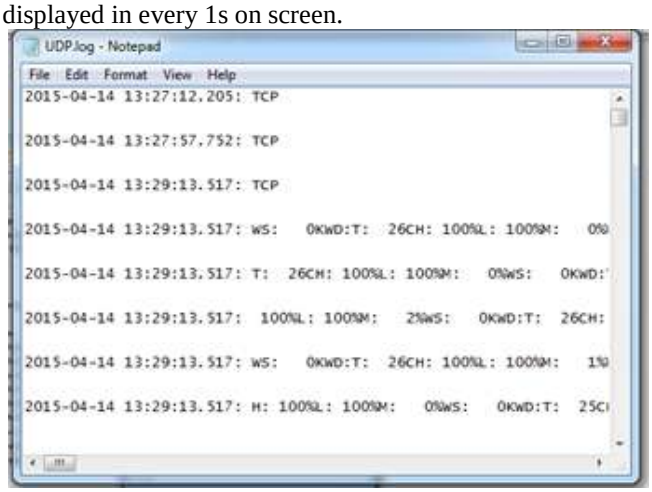

Figure 2: Result On Logger

4. Conclusion and Future Scope

Advanced TCP/IP data logger based agriculture monitoring system serves as a reliable and efficient system for efficiently monitor the environmental parameters. Wireless monitoring of field not only allows user to reduce the human power, but it also allows user to see accurate changes in it. It is much cheaper in cost, consumes less power which in turn leads to the development of lots of new technologies like Home Automation, Health Care Automation.

Further research could include by addingmore sensors into the system. WI-FI based sensors could be used for increasing speed of operation. TCP/IP data logger can be operated using android application which will able to handle multiple operation for any situation. For linearity in operation IC based sensor could also be used.

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