Real Time Field Monitoring and Controlling System

K. Chenna Kesava Reddy, P.Venkatrao

Abstract- Modern agriculture management relies strongly on many different sensing methodologies to provide accurate information on temperature, status of the land, ambient pressure in the field etc. Almost every sensing technique may find an application in agriculture.

A real time field monitoring and controlling system is implemented using ARM controller in the present study. Experiments were carried out at lab scale to sense temperature, nature of the land and pressure. All these parameters will be uploaded to the server and field information can be monitored.

Key Words: Agricultural Field monitoring, ARM controller, Server, Sensor.

I. INTRODUCTION

This paper aims to establish a field monitoring and controlling system that is capable of real time and accurate measurement of field information. The design of monitoring system is composed of distributed sensing devices such as application specific temperature sensor, moisture sensor and pressure sensor.

Sensors are used to monitor physical and environmental parameters such as temperature, pressure and moisture content in the field. Sensing unit has sensors and analog to digital converter (ADC) to convert analog sensed signal to digital data. This digital data is processed by the micro controller unit. From here the data is sent to the GPRS (General Packet Radio Service) module and uploaded to the server from which farmer can access the data from anywhere in the world. The information is also sent to LCD module.

In the sensing unit, a soil moisture sensor is present which indicates the moisture content in the field. When the land is observed to be dry then automatically the motor will be started but if it is found to be wet the motor will be in its idle state.

II. MICROCONTROLER

In this work the micro-controller plays major role. Micro-controllers were originally used as components in complicated process control systems. However, because of their small size and low price, Micro-controllers are being used in regulators for individual control loops. In several areas Micro-controllers are now outperforming their analog counterparts.

Due to their tiny size and low power consumption, LPC2148 are ideal for applications where miniaturization is a key requirement, such as access control and point of sale.

Serial communication interfaces ranging from a USB 2.0 Full-speed device, multiple UARTs, SPI, SSP to I2C bus and on-chip SRAM of 8 kB up to 40 kB, make these devices very well suited for communication gateways and protocol converters, soft modems, voice recognition and low end imaging, providing both large buffer size and high processing power. Various 32-bit timers, single or dual 10-bit ADCs, 10-bit DAC, PWM channels and 45 fast GPIO lines with up to nine edge or level sensitive external interrupt.

III. GPRS MODULE

The GPRS system is an integrated part of the GSM (Global System for Mobile Communications) network switching subsystem. GSM is a quad band modem being able to operate in 800, 900, 1800, 1900 MHz. This modem can accept any GSM network operator SIM card and act like a mobile phone with its own unique phone number. Advantage of using this modem will be that one can use its RS 232 port to communicate and develop applications like SMS control, data transfer, remote control and data logging easily.

The modem can either be connected to PC serial port directly or to any microcontroller .It can be used to send and receive SMS or make/receive voice calls. It can be used in GPRS mode to connect to internet and any application for data logging and control. In GPRS mode it can also connect to any remote FTP server and upload files for data logging.

This GSM modem is highly flexible plug and play, quad band GSM modem for direct and easy integration to RS 232 applications. Supports features like Voice, SMS, Data/Fax, GPRS and integrated TCP/IP stack. SIM 300 is highly reliable for 24X7 operation with matched antenna, status of the modem indicated by LED, simple to use, low cost and quad band modem supports all GSM operators.

IV. BLOCK DIAGRAM

The system module consists of sensing block which has several types of sensors deployed in the crop field area. Temperature, moisture and pressure sensors are the part of the unit used to monitor the crop field. The data sensed by the sensors from different places of a crop field area is passed to

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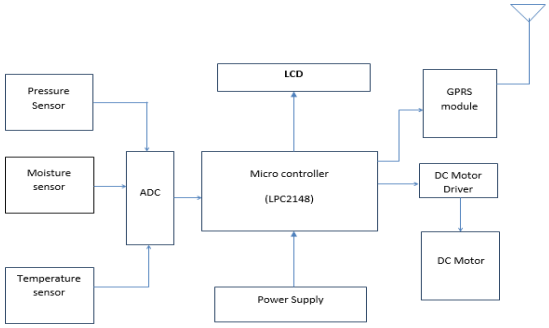

Fig 1: Block Diagram

The analog to digital converter to obtain the digital data, which is then processed by the data processing unit. The processed data is then sent to the LCD module and GPRS module, depending on the sensed information from sensors control action will be taken simultaneously, that is when the land is WET, the motor automatically switched OFF and if it is DRY the motor switched ON. The GPRS modem passes the information to the server which is going to be monitored by the farmer through the URL of the webserver.

V. FLOW CHART

The design flow used in the implementation of System is shown in Fig 2.

VI. ADVANTAGES OF THE SYSTEM

In this work, sensors are used for monitoring the crop field area by deploying soil moisture sensors in the land to detect the places where the water level is low. From the results irrigation to that particular place only can be carried out. By using, soil moisture sensor the farmer can get to know the status of the land weather it is WET or DRY. Depending on this condition, controller will decide to switch ON the motor or switch OFF the motor. By this method water can be conserved and the Problem of water logging in the land can also be minimized. If there is any chance for rainfall, the farmer need not irrigate the crop field. Due to this, water is conserved and power consumption can be reduced as it is not necessary to run the motors. Environment temperature and pressure are randomly varying quantities in the crop field. By using temperature and pressure sensors the farmer can detect the temperature, pressure of the field and irrigate the water to the crop field area. By the proposed system the farmer can get an idea about the climatic conditions prevailing around the crop field.

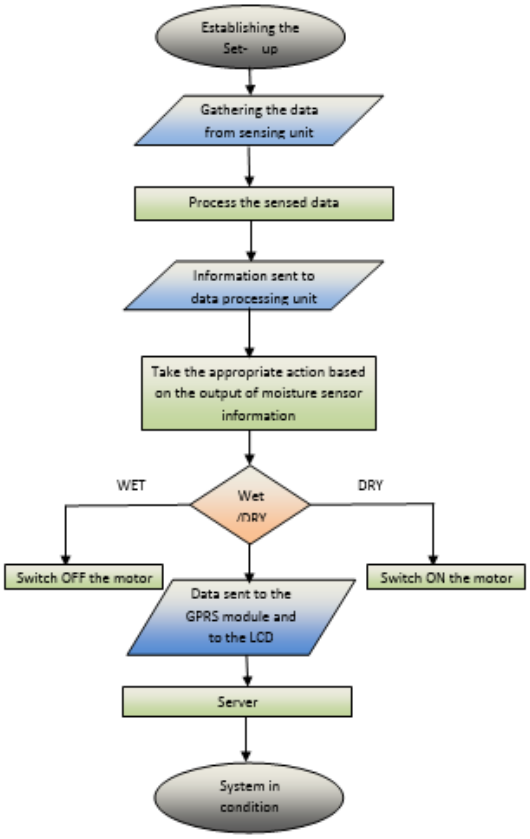

Fig 2: Flow chart shows system design flow

VII. EXPERIMENTAL SETUP

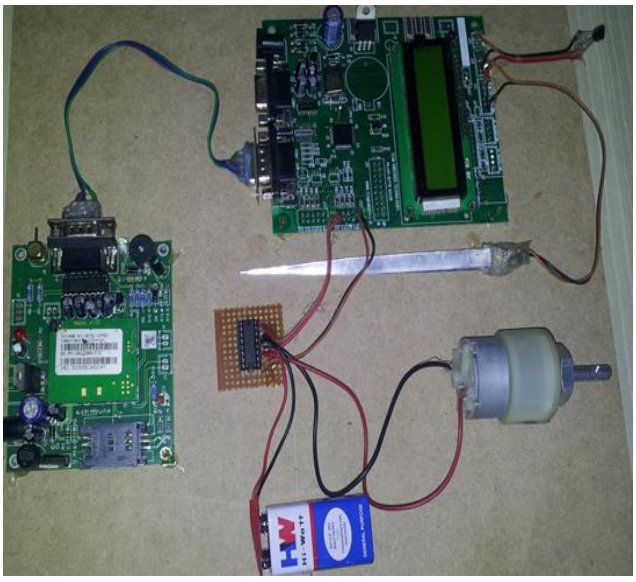

Fig 3: Experimental setup

Figure shows the experimental setup of proposed system. It consists of three sensors, Temperature, pressure and moisture sensor connected to microcontroller via ADC channel. The output of microcontroller is fed to GPRS module and the LCD display, which displays the most recent data for the parameters. The system uses the H bridge driver to drive a higher rating motor to operate pump set. These values are uploaded to the webserver, from where the farmer can access the data.

VIII. RESULT AND ANALYSIS

Table I: Temperature and Pressure Readings

S.NO	TEMPERATURE (°c)	PRESSURE (kpa)	STATUS OF THE LAND	TIME
1	22	100.6	WET	2.30 A.M
2	21	100.7	DRY	5:30 A.M
3	27	100.9	WET	8:30 P.M
4	31	100.9	WET	11:20 P.M
5	32	100.6	DRY	2:30 P.M
6	31	100.5	DRY	5:30 P.M
7	25	100.8	WET	8:30 P.M
8	24	100.9	DRY	11.30 P.M

The above data was received from the temperature and pressure sensor, which were connected to the microcontroller. The data was uploaded in the server is shown in the above table. The results are taken in the real time in a farmer's field.

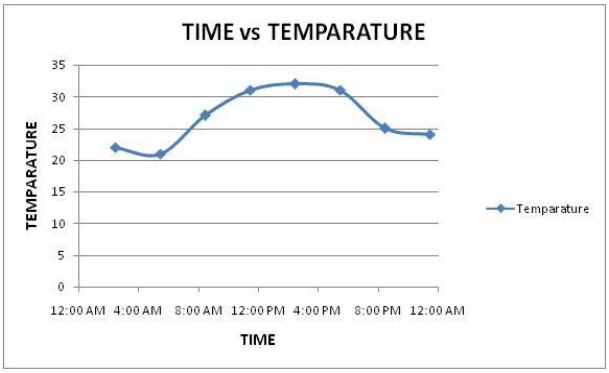

Fig 4: Temperature Vs Time

Above graph shows the temperature readings when implemented in real time environment. The result shows that the temperature is a varying quantity in the paddy crop field area.

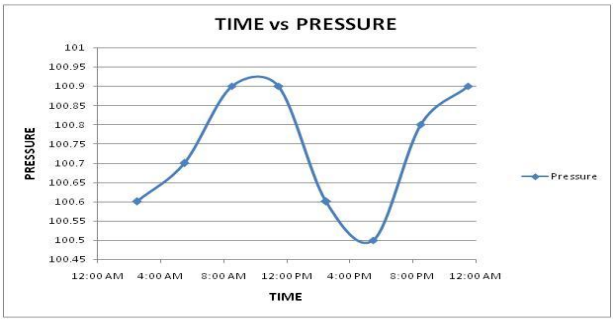

Fig 5: Pressure Vs Time

Above graph shows the temperature readings when implemented in real time environment. The result shows that the temperature is a varying quantity in the paddy crop field area.

IX. CONCLUSION

In this paper, utilization of sensors in the crop field area is discussed and this gives the proposed architecture for real time field monitoring with LPC2148 microcontroller. Analysis of real time readings of temperature, pressure and moisture content is given by deploying them in real time. Results shows that LPC 2148 microcontroller is aptly suitable for crop field monitoring.

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