

# Review for ARM Based Agricultural Field Monitoring System

Ms. Shweta S. Patil\*, Prof. Mrs. A. V. Malviya\*\*

\* Department of Elect and Telecomm, Sipna college of engg and technology, Amravati, INDIA

\*\* Department of Elect and Telecomm, Sipna college of engg and technology, Amravati, INDIA

**Abstract-** The paper “ARM Based Agricultural Field Monitoring System using GSM” is mainly focused on modernizing the irrigation technology in agriculture and also to provide adequate irrigation in particular area. The set up consists of mainly ARM7TDMI core and GSM. GSM serves as an important part as it is responsible for controlling the irrigation on field and sends them to the receiver through coded signals. GSM operates through SMS and is a link between ARM processor and centralized unit. ARM7TDMI is an advanced microprocessor and forms the heart of the system. Our project aims at modernizing the agricultural technology by programming the components and building the necessary hardware to automate farming. This project is mainly used to detect the exact field condition as well as weather conditions in real time. The information is given on user request in the form of SMS. GSM modem is controlled with the help of standard set of AT (Attention) commands. These commands are used to control majority of the functions of GSM modem.

**Index Terms-** GSM modem, AT commands, ARM7TDMI, irrigation.

## I. INTRODUCTION

This paper deals with the irrigation industry. Automated irrigation is an interesting application, for real time irrigation of agricultural environment for advancement of agriculture. ARM7TDMI processor is general purpose microprocessor in embedded world which is used in industrial level applications. GSM, as we know, is the most widely used mobile technology, using a simple Subscriber Identity Module (SIM), it has taken the world of mobile communication to new heights. It is based on a simple architecture. With the introduction of new technologies like CDMA, GSM has stood its strength due to its efficiency and simplicity. In our project, we are basically concentrating on following applications such as:

To continuously monitor and control the soil moisture.

To continuously monitor and control the water level of well.

To monitor the dew point content, temperature and humidity so as to forecast the weather condition.

To control the whole system through GSM modem.

It gives the detail information about the field condition to the user through SMS. Maintain faithful irrigation of the farm

field by constant monitoring 3-phase supply and other field parameters. The system consists of a centralized unit, much like a mobile base station, consisting of the subscriber number which forms the link between the user and the device. The whole system works in the form of network being connected to the centralized unit as a node. The centralized unit is connected to many such nodes for receiving and sending the data. The user communicates with the central unit by sending and receiving SMS, which will be received with the help of the SIM card on GSM device. From GSM it is sent to ARM7. Again ARM7 also continuously receives the data from sensors in the form of codes. Which after processing, this data is displayed on LCD. The communication between all devices takes place through RS232. Thus, whenever the system receives the activation command from the subscriber it checks all the field conditions and gives a detailed feedback to the user and waits for another activation command to start the motor, in the form of SMS. The motor is controlled by a simple manipulation in the internal structure of the starter coil. The starter coil is indirectly activated by means of a transistorized relay circuit. Once the motor is started, a constant monitoring on soil moisture and water level is done and as soon as the soil moisture is reached to sufficient level the motor is automatically turned off & a message is sent to subscriber that the motor is turned off.

## II. LITERATURE REVIEW

[8] In this paper we have discussed about how to utilize the sensor in the paddy crop field area and gives proposed architecture for real time paddy crop field monitoring with zigbee wireless sensor network analyzed about real time readings of temperature and humidity sensor deployed in real time. Result shows that zigbee wireless sensor network is efficient for paddy crop field monitoring. Now we are working in the part how to resend the packets when packet loss occurs and also doing simulation work for more number of nodes implementing in the paddy crop field environment. The proposed work gives efficient monitoring of paddy crop field monitoring.

[9] The project is thus carried out using ARM7TDMI core with the help of GSM technologies. This project finds application in domestic agricultural field. In civilian domain, this can be used to

ensure faithful irrigation of farm field, since we have the option of finding out moisture level of soil in a particular area

[10] The article based on embedded database of greenhouse temperature and humidity control system intelligent. Put forward by embedded database system set up in an ideal environment for data greenhouse temperature and humidity control, greenhouse crops in the process of growth under control.

[11] The purpose of this paper is to provide a review of a range of popular sensors on the market. The paper also discusses their operating principles as well as addresses their advantages and disadvantages.

[12] This project implements the emerging applications of GSM technology. Using GSM networks, a control system has been proposed that will act as an embedded system which can monitor and control an agricultural motor and other devices locally using built-in input and output peripherals.

### III. SYSTEM DESCRIPTION

The proposed system architecture has several types of nodes deployed in the crop field area. It captures the physical conditions such as temperature, pressure, humidity, water level, pH can be continuously monitored in a paddy crop field. All sensed data from various places of crop field area is transmitted to the central Global System of Mobile (GSM) node or coordinator node. From the GSM node sensor, the data are sent to the data base. A server is connected to the database, which has minimum and maximum threshold value of temperature, water level, Ph level previously stored in software. If the sensed data attains maximum or minimum threshold level stored in the data base, the alarm unit will give an alarm sound to the farmer. After which the farmer may get attention of the cultivated area. The alarm may be in the form of SMS sent from the GSM modem on subscribers mobile.

#### a. HARDWARE DISCRIPTION

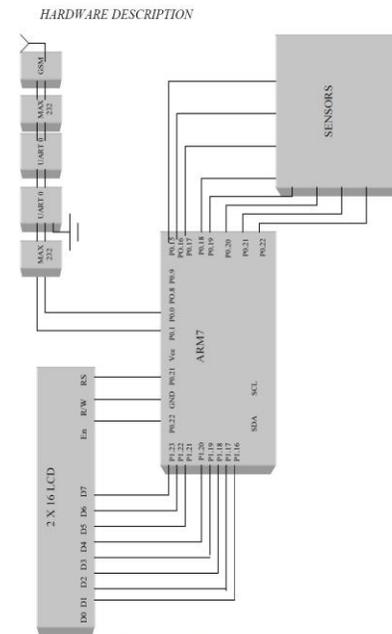


Fig. 2.1 Layout of RAIS

### IV. ARM7TDMI MICROPROCESSOR:

We have used ARM7TDMI processor in our hardware due to its advanced features described below. ARM7 consists of a number of features. ARM7 processor is a link between GPS and GSM modules for communication. The description of ARM7 is discussed in further sections.

#### 2.1 Features

- The 16/32-bit ARM7TDMI-S microcontroller has a 64 or 144 pin package.
- It has 16 kB on-chip Static RAM.
- It has 128/256 kB on-chip Flash Program Memory, 128-bit wide interface/accelerator that enables high speed 60 MHz operation.
- It supports In-System Programming (ISP) and In-application Programming (IAP) via on-chip boot-loader software. Single sector or full chip erase takes 400 ms. Flash programming takes 1 ms per 512 byte line
- It has two 32-bit timers (with 4 capture and 4 compare channels), PWM unit (6 outputs), Real Time Clock and Watchdog.
- It has multiple serial interfaces including two UART(16C550), Fast I2C (400 kbits/s) and two SPIs
- It has 60 MHz maximum CPU clock available from programmable on-chip Phase-Locked Loop.
- It has on-chip crystal oscillator with an operating range of 1MHz to 30 MHz.
- It supports two low power modes, Idle and Power-down.
- Processor wake-up from Power-down mode using an external interrupt.

## GLOBAL SYSTEM FOR MOBILE COMMUNICATION (GSM)

A GSM modem is a wireless modem that works with a GSM wireless network. Modem is controlled by computer using AT commands. Both GSM modems and dial-up modems support a common set of standard AT commands. We can use the GSM modem just like a dial-up modem. But the main difference between them is a dial-up modem sends and receives data through a fixed telephone line while a wireless modem sends and receives data through radio waves. GSM is one of the most vital components in our set up since all the communication between the users and centralized unit takes place through this modem. GSM communicates with ARM through I2C bus. A GSM modem can be an external device or a PC Card. Typically, an external GSM modem is connected to a computer through a USB cable or a serial cable. Similar to a GSM mobile phone, this GSM modem requires a SIM card from a wireless carrier in order to operate.

### 4 AT Commands According to GSM07.05

The GSM 07.05 commands are for performing SMS and CBS related operations. SIM supports both Text and PDU modes.

#### 4.1 Overview of AT Commands According to GSM07.05

Command	Description
AT+CMGD	DELETE SMS MESSAGE
AT+CMGF	SELECT SMS MESSAGE FORMAT
AT+CMGL	LIST SMS MESSAGES FROM PREFERRED STORE
AT+CMGR	READ SMS MESSAGE
AT+CMGS	SEND SMS MESSAGE
AT+CMGW	WRITE SMS MESSAGE TO MEMORY
AT+CMSS	SEND SMS MESSAGE FROM STORAGE
AT+CMGC	SEND SMS COMMAND

## V. ADVANTAGES

In paddy crop field we have to irrigate the land completely. We have to irrigate depending upon the soil, ups and downs of the land and where it needs. At present, there is no mechanism to find where irrigation is needed. In this paper, we made sensor network for monitoring the crop field area by deploying water sensors in the land to detect the places where the water level is low. From those results we irrigate that particular place only. From the above methodology we can conserve water and minimize the problem of water logging in the land. We used humidity sensor to sense the weather. Using this the farmer can get idea about the climate. If there is any chance for rainfall, the farmer need not water the crop field. With this we can conserve water and also power. In present irrigation system the fertilizer level is increasing, which affects people. Using pH sensors we get the information about the soil and analyze the acid content, by which we can apply required fertilizers to the place where it needs, and avoid over fertilization of the field area. Temperature

is a randomly varying quantity in the environment of paddy farm. Using temperature sensors we can detect the temperature, and provide water to the crop in cultivated area.

## VI. FUTURE SCOPE OF THE PROJECT

- The future scope of this project is enhanced application with the addition of the required features. One such application is to detect the soil parameter and suggesting the proper fertilizer and its feed time. Such Sensors can be incorporated in the design. It can also be designed to detect the particular disease on the plant and suggest the proper curative measures on it.
- In the same way one can predict the exact weather if the system is made to communicate with the nearer weather station through satellite communication.

## VI. CONCLUSION

Thus, project is proposed out using ARM7TDMI core with the help of GSM technologies. This project finds application in domestic agricultural field. This can also be used to ensure faithful irrigation of farm field in civilian domain, as well as for horticulture and floriculture areas, since we have the option of finding out moisture level of soil in a particular area

## REFERENCES

- [1] ARM7TDMI, Technical Reference Manual.
- [2] ARM, Rev. 01 – 06, February 2004.
- [3] GPS4beginners, Rev. A, December 2000.
- [4] lpc-ARM-book-srm, The Insider's Guide to the PHILIPS ARM7 – Based Microcontrollers.
- [5] UM\_LPC21XX\_LPC22XX\_2, LPC2129 User Manual, 03 May 2004.
- [6] AT Commands Interface Guide at Version: 004, 05 April 2002.
- [7] David E. Simon, An Embedded Software Primer, fifth edition, 2007.
- [8] 'Real Time Paddy Crop Field Monitoring Using Zigbee Network', by K. Nirmal Kumar P.Ranjith R.Prabakaran 978-1-4244-7926-9/11/\$26.00 ©2011 IEEE
- [9] 'Real-Time Automization Of Agricultural Environment for Social Modernization of Indian Agricultural System' by :Mahesh M. Galgalikar 978-1-4244-5586-7/10/\$26.00 C 2010IEEE
- [10] 'Based on Embedded Database Greenhouse Temperature and Humidity Intelligent Control System' by SUN Rong-gao, WAN Zhong, SUN De-chao ISSN: 1109-2734 Issue 1, Volume 8, January 2009
- [11] 'Review of Sensors for Greenhouse Climate Monitoring' by Vu Minh Quan, Gourab Sen Gupta, Subhas Mukhopadhyay 978-1-4244-8064-7/11/\$26.00 ©2011 IEEE
- [12] 'Remote Access to Agricultural Motor through the Usage of GSM and SMS Technologies' by Karthik Maddipatla, Thentu Sravani, Thota Rajesh, R.S.V. Mani Krishna, J. Avinash Vol. 1, No. 3, 2012, ISSN 2166-2924

AUTHORS

**First Author** – Ms. Shweta S. Patil, M.E. (Digital Electronics)-  
2<sup>nd</sup> year, SIPNA's college of Engineering. And Technology,  
Amravati, INDIA., patilsshweta@rediffmail.com

**Second Author** – Prof. Mrs. A. V. Malviya, M.E.(Digital  
electronics) ,working as Professor in Department of Electronics

and Telecommunication., SIPNA's college of Engineering. And  
Technology, Amravati, INDIA.

**Correspondence Author** – Ms. Shweta S. Patil, M.E. (Digital  
Electronics)-2<sup>nd</sup> year, SIPNA's college of Engineering. And  
Technology, Amravati, INDIA., patilsshweta@rediffmail.com