Real Time Paddy Crop Field Monitoring using Zigbee Network

PRADEEP KUMAR K\textsuperscript{1}, NARSAPPA REDDY\textsuperscript{2}, MIRZA SAJID ALI BAIG\textsuperscript{3}

\textsuperscript{1}PG Scholar, P Indra Reddy Memorial Engineering College, Chevella, TS, India, E-mail: pradeep4u77@gmail.com.
\textsuperscript{2}Associate Professor & HOD, P Indra Reddy Memorial Engineering College, Chevella, TS, India, E-mail: narsapa@gmail.com.
\textsuperscript{3}Associate Professor, P Indra Reddy Memorial Engineering College, Chevella, TS, India, E-mail: mirjasir@gmail.com.

Abstract: In this project we have implements a system which can detect the water level in the field and supply water to the field which has water requirement. The project is lpc2148 microcontroller based design which controls the water supply and the field to be irrigated. There are sensors present in each field which are not activated till water is present on the field. Once the field gets dry sensors sense the requirement of water in the field and send a signal to the microcontroller. Microcontroller then supply water to that particular field which has water requirement till the sensors is deactivated again. In case, when there are more than one signal for water requirement then the microcontroller will prioritize the first received signal and irrigate the fields accordingly. These total operations are monitored through PC using ZIGBEE. This project uses regulated 5V, 750mA & 12V, 500mA power supply. 7805 and 7812 three terminal voltage regulators are used for voltage regulation. Bridge type full wave rectifier is used to rectify the ac output of secondary of 230/12V step down transformer.

Keywords: WSN, Zigbee, LPC, Reduced Instruction Set Computer (RISC), MAC.

I. INTRODUCTION

Wireless sensor network is a network in which several types of sensor nodes are deployed. Wireless sensor network is scalable, consumes very little power, fast data acquisition and software programmable. A WSN (wireless sensor network) generally consists of base station (or) gateway that can communicate with a number of wireless sensors via a radio links. WSN can eliminate the cost of installation, maintenance and eliminates connectors. ZigBee is a low-cost, low-power, wireless mesh network standard. The low cost allows the technology to be widely deployed in wireless control and monitoring applications, the low power-usage allows longer life with smaller batteries, and the mesh networking provides high reliability and larger range. The sensing technologies allow the identification of pests in the crops, drought or increased moisture. Zigbee technology can be applied for wireless applications in agriculture sector. In this crop field monitoring, mesh topology is used and the data that is sensed from various sensors goes to the central Global System for Mobile (GSM) node which will send the information to the personal computer used by the farmer.

This paper shows the model for perfect real time monitoring of crop field by using zigbee network and it even displays the experimental results when the nodes are deployed in real time. Physical and MAC (Medium Access Control) layers of zigbee. The functionality of both transmitter and receiver are combined into a single device known as transceivers. The fundamental concept is to provide a highly enabled monitoring of crop field by focusing on the data that is received from various sensors in the paddy crop field. ARM is abbreviated as Advanced RISC Machines. RISC (Reduced Instruction Set Computer) is a type of microprocessor architecture.

II. BLOCK DIAGRAM

A. Transmitter

B. Receiver

Fig.1. Block Diagram at the Transmitter section.

Fig.2. Block Diagram at the Receiver section.

Copyright © 2015 IJIT. All rights reserved.
In this project we are using the LPC 2148 microcontroller; it is the ARM 7 family. The block diagram consists of three types of sensors, clock circuit, LCD display, MAX 232 and zigbee modules. Each blocks having the different functionality as shown in Figs.1 and 2.

**Working:** The transmitter section consist of micro controller, sensors, lcd display and zigbee module. When the water is not sufficient to the field that time the sensors will sense the field conditions and send the information to the micro controller. The micro controller sends the information to the relay circuit the relay is acts like a switch it is used to ON the motor automatically. The zigbee module is used at transmitter and receiver section. it sends the information from the transmitter to receiver. The current operation is displayed on the LCD display. At the receiver section we have an PC, in that we can monitor the field conditions and the temperature and moisture values.

### III. RELATED STUDY

**A. ARM7**

ARM7 family includes the ARM7TDMI, ARM7TDMI-S, ARM720T, and ARM7EJ-S processors. The ARM7TDMI core is the industry’s most widely used 32-bit embedded RISC microprocessor solution. Optimized for cost and power-sensitive applications, the ARM7TDMI solution provides the low power consumption, small size, and high performance needed in portable, embedded applications. The ARM7TDMI-S core is the synthesizable version of the ARM7TDMI core, available in both VERILOG and VHDL, ready for compilation into processes supported by in-house or commercially available synthesis libraries. The ARM720T hard macro cell contains the ARM7TDMI core, 8kb unified cache, and a Memory Management Unit (MMU) that allows the use of protected execution spaces and virtual memory. This macro cell is compatible with leading operating systems including Windows CE, Linux, palm OS, and SYMBIAN OS.

**B. Zigbee Module**

The mission of the ZigBee Working Group is to bring about the existence of a broad range of interoperable consumer devices by establishing open industry specifications for unlicensed untethered peripheral, control and entertainment devices requiring the lowest cost and lowest power consumption communications between compliant devices anywhere in and around the home as shown in Fig.3.

ZigBee is a wireless technology developed as an open global standard to address the unique needs of low-cost, low-power, wireless sensor networks. The standard takes full advantage of the IEEE 802.15.4 physical radio specification and operates in unlicensed bands worldwide at the following frequencies: 2.400–2.484 GHz, 902-928 MHz and 868.0–868.6 MHz. The protocol allows devices to intercommunicate and be powered by batteries that last years instead of hours. The ZigBee protocol carries all the benefits of the 802.15.4 protocol with added networking functionality.

**C. RS 232 Cable**

Thus the RS-232 signal levels are far too high TTL electronics, and the negative RS-232 voltage for high can’t be handled at all by computer logic. To receive serial data from an RS-232 interface the voltage has to be reduced. Also the low and high voltage level has to be inverted. This level converter uses a Max232 and five capacitors. The max232 is quite cheap (less than 5 dollars) or if you’re lucky you can get a free sample from Maxim. The MAX232 from Maxim was the first IC which in one package contains the necessary drivers and receivers to adapt the RS-232 signal voltage levels to TTL logic. It became popular, because it just needs one voltage (+5V or +3.3V) and generates the necessary RS-232 voltage levels.

### IV. HARDWARE RESOURCES

**A. LPC2148 Microcontroller**

LPC2148 microcontroller board based on a 16-bit/32-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, that combine microcontrollers with embedded high-speed flash memory ranging from 32 KB to 512 KB. A 128-bit wide memory interface and unique accelerator architecture enables 32-bit code execution at the maximum clock rate. For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30% with minimal performance penalty. The meaning of LPC is Low Power Low Cost microcontroller. This is 32 bit microcontroller manufacture by Philips semiconductors (NXP). Due to their tiny size and low power consumption, LPC2148 is ideal for applications where miniaturization is a key requirement, such as access control and point-of-sale.

**B. Power Supply Circuit**

The main building block of any electronic system is the power supply to provide required power for their operation. For the microcontroller keyboard, LCD, GSM, +5V are required & for driving buzzer +12V is required. The power supply provides regulated output of +5V & non-regulated output of +12V. The hardware part consists of the components and the sensors used in the system. This part mainly collects the status of the sensors and stores it into the micro controller’s EEPROM.

**C. LCD (Liquid Crystal Display)**

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily

---

**Fig.3. ZigBee chip.**
programmable; have no limitation of displaying special & even custom characters (unlike in seven segments), animations and so on. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix.

D. DC Motor

For the Closing the ATM door, we are using DC motors. It is operated by 12VDC power supply. In any electric motor, operation is based on simple electromagnetism. A current carrying conductor generates a magnetic field; when and to the strength of the external magnetic field. Here we are placing DC Motor for closing the ATM door while thieves are trying to broken the ATM machine.

E. L293D Driver

L293D is a dual H-bridge motor driver integrated circuit (IC). Motor drivers act as current amplifiers since they take a low-current control signal and provide a higher-current signal. This higher current signal is used to drive the motors. L293D contains two inbuilt H-bridge driver circuits. In its common mode of operation, two DC motors can be driven simultaneously, both in forward and reverse direction.

Features:
- Wide Supply-Voltage Range: 4.5 V to 36 V.
- Output Current 1 A Per Channel (600 mA for L293D).
- Peak Output Current 2 A Per Channel (1.2 A for L293D).

V. SOFTWARE IMPLEMENTATION

For the software implementation, we deploy two software packages. First one is the Keil µVision 4.0. Second one is the Flash magic simulator. The Keil µVision Debugger accurately simulates on-chip peripherals (PC, CAN, UART, SPI, Interrupts, I/O Ports, A/D Converter, D/A Converter, and PWM Modules) of ARM7 device. Simulation helps to understand hardware configurations and avoids time wasted on setup problems. With simulation, we can write and test applications before target hardware is available. The system program written in embedded C using KEIL IDE software will be stored in Microcontroller. Keil development tools for the Microcontroller Architecture support every level of software developer from the professional applications engineer to the student for learning about embedded software development. The industry-standard Keil C Compilers, Macro Assemblers, Debuggers, Real-time Kernels, Single-board Computers, and Emulators support all ARM7 derivatives. The Keil Development Tools are designed to solve the complex problems facing embedded software developers. Flash magic is used to dump the code to microcontroller from PC.

VII. REFERENCES


Websites:
http://www.google.co.in/
http://www.keil.com/
http://www.wikipedia.org/