An Environmental Monitering System Based on Zigbee for Emergency Application.

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Abstract

This project implements a fast disposing Wireless Sensor Network (WSN) with low power consumption. The system, which is based on ZigBee technology, detects environment information, such as temperature, relative humidity and pressure etc. By the portable structure design, the system can be established or dismantled quickly in a desired area, such as an incomplete building, a temporary watched environment and emergency scene, etc. The principle of this project is to develop a portable environmental monitoring system based on ZigBee wireless module. The main components of this project are microcontroller, wireless module (ZigBee), Fire sensor, temperature and Smoke sensor, and interfacing unit (MAX 232). The sensor senses the environment and sends the signal to the microcontroller, which transmits this signal to the monitoring node using the wireless module (ZigBee). In the monitoring node the wireless module receives the signal and transmits to the monitoring PC through the interfacing circuit (MAX232).

Introduction

This project uses regulated 5V, 500mA power supply. 7805 three terminal voltage regulator is used for voltage regulation. The programming language used for developing the software to the microcontroller is Embedded/Assembly. The AVR STUDIO is used to edit, compile and debug this Program. SINAPROG programmer is used for burning the developed code on AVR STUDIO in to the microcontroller Chip. Here in our application we are using AVR microcontroller which is Flash Programmable IC.

Existing System:

In this existing system the environment Monitering system has to be maintained using an antenna and RADARS. Here for maintaining the environment we have a system to moniter the environment and through this we receive a signal from RADAR System and form that we receive to the system. This is connected through a wire to all the devices like RADAR System to PC Monitering system.

Proposed System

In this proposed system, ZIGBEE is used to transmit the data and sensor senses the environment and sends the signal to the microcontroller, which transmits this signal to the monitoring node using the wireless module (ZigBee). In the monitoring node the wireless module receives the signal and transmits to the monitoring PC through the interfacing circuit (MAX232). The principle of this project is to develop a portable environmental monitoring system based on ZigBee wireless module. The main components of this project are microcontroller, wireless module (ZigBee), Fire sensor, temperature and Smoke sensor, and interfacing unit (MAX 232).

Hardware Description

The following is the schematic Design of sensor node block diagram.

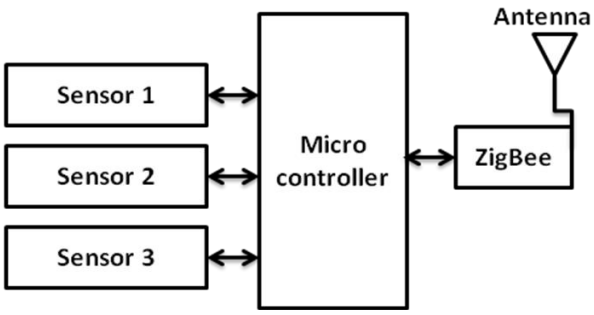

Figure: Sensor node block diagram.

We can see the design flow of the sensor node block diagram and here we can see that we have used microcontroller and Zigbee. But the sensor receivers a signal and sends the data to microcontroller and from that it transmit to the wireless device called ZIGBEE, as shown.

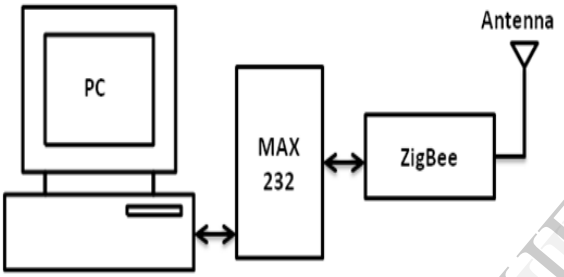

Figure: Monitering node block diagram

Microcontroller

The 32-bit microcontroller has been specifically developed to provide a high-performance low-cost platform for a broad range of applications, including microcontroller's automotive body system, industrial control system and wireless networking. It is a 32-bit processor, with a 32-bit wide data path register bank and memory interface. LPC 1768 has 512 KB flash memory and 64KB data memory.

Zigbee

Zigbee is a name of a specification for a suit of high level communication protocols using small, low power digital radios based on the IEEE 802.15.4-2006 standard for wireless personal area networks (WPAN's) such as wireless headphones connected to mobile with a short range of radio. The technology is extended to be a simpler and less expensive than other WPAN's such as Bluetooth. Zigbee is targeted at radio-frequency (RF) application that requires a low data rate, long battery life, and secure networking.

Max-232

This max -232 is used to convert TTL logic levels to the RS-232 voltage levels, and vice versa. Max-232 IC chips are commonly referred to as line drives. Today RS-232 is mostly widely used serial I/O interfacing standard, in RS-232 at 1bit is represented by -3 to -25V, while a 0bit is +3v to +25v, making -3 to +3 undefined. For this reason, to connect any RS-232 to a microcontroller system we must use voltage converter such as MAX-232.Here the MAX-232 is used to transmit data received from ZIGBEE, it transfers to PC.

At-mega 8

This is an 8-bit microcontroller with advance RISC architecture, 8kbyte of in-system self-programmable flash program memory and 512 bytes of EPROM. 1kbyte of internal SRAM. The AT-MEGA8 contains 8kbyte on-chip in-system reprogrammable flash memory for program storage. Since all AVR instructions are 16-bit or 32-bit wide, the flash is organized as 4k x 16bits.

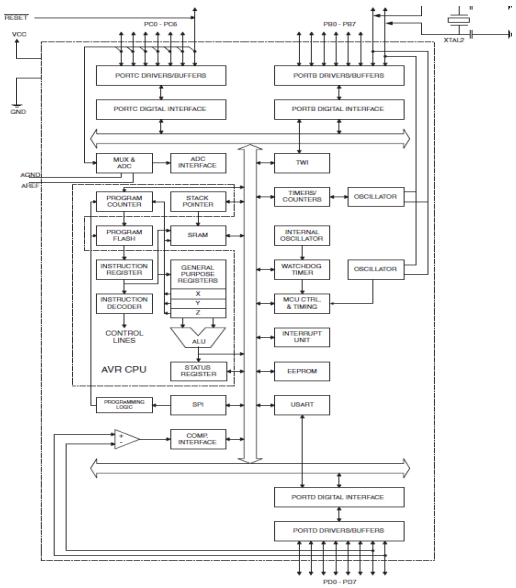

Figure: Block diagram of AT-MEGA.

For software security, the flash program memory space is divided into two sections, boot program section and application program section. The flash memory has an endurance of at least 10,000 write/erase cycles. The AT-MEGA8 program counter (PC) is 12 bit wide, thus addressing the 4k program memory locations. Constant tables can be

allocated within the entire program memory address space.

Watchdog Timer

The watchdog timer is clocked from separate On-chip oscillator which runs at 1MHZ. This is the typical value at VCC = 5V. See characterization data for typical values at other VCC levels. By controlling the watchdog timer is also reset when it is disable and when a chip reset occurs.
Eight different clock periods can be selected to determine the reset period. If the reset period expires without another watchdog reset, the AT-MEGA8 resets and executes from the reset vector. To prevent unintentional disabling of the watchdog, a special turn-off sequence must be followed when the watchdog is disabled.

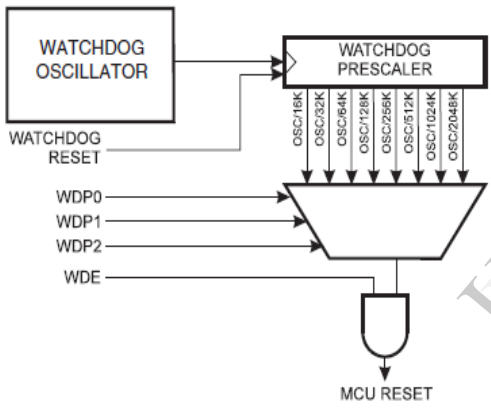

Figure: schematic of Watchdog timer.

Voltage Regulator 7805

The LM78XX/LM78XXA series of three-terminal positive regulators are available in the TO-220/D-PAK package and with several fixed output voltages, making them useful in a Wide range of applications. Each type employs internal current limiting, thermal shutdown and safe operating area protection, making it essentially indestructible. If adequate heat sinking is provided, they can deliver over 1A output Current. Although designed primarily as fixed voltage regulators, these devices can be used with external components to obtain adjustable voltages and currents.

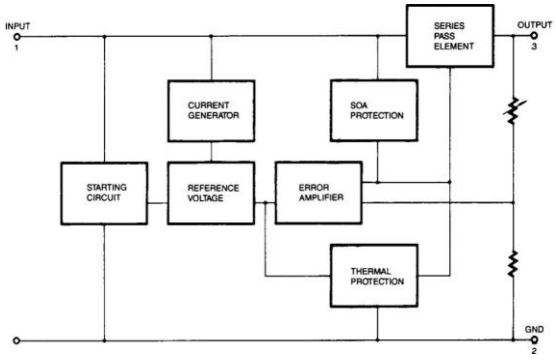

Figure: Block diagram of Voltage Regulator.

LED

LEDs are semiconductor devices. Like transistors, and other diodes, LEDs are made out of silicon. What makes an LED give off light are the small amounts of chemical impurities that are added to the silicon, such as gallium, arsenide, indium, and nitride. When current passes through the LED, it emits photons as a by product. Normal light bulbs produce light by heating a metal filament until it is white hot. LEDs produce photons directly and not via heat, they are far more efficient than incandescent bulbs

Result

The project "An Environmental Monitering System Based on Zigbee for Emergency Application" In Environmental monitoring system we have temperature and fire monitoring system where the temperature values are continuously monitored and digitized through ADC and displayed on LCD display. At the same time the values are transferred through Zigbee wirelessly to remote destination zigbee module and displaying information on PC. In this project fire is also monitoring continuously. If fire alerting occurs then automatically buzzer will indicate Audio Alert and sends the message wirelessly through zigbee protocol to destination PC.

Conclusion

The project we have undertaken has helped us gain a better perspective on various aspects related to our course of study as well as practical knowledge of electronic equipments and communication. We became familiar with software analysis, designing, implementation, testing and maintenance concerned with our project. The extensive capabilities of this system are what make it so interesting. From the convenience of a simple

zigbee protocol monitoring remote environmental conditions like fire and temperature successfully achieved.

Future Scope

The future implications of the project are very great considering the amount of time and resources it saves. The project we have undertaken can be used as a reference or as a base for realizing a scheme to be implemented in other projects of greater level such as weather forecasting, temperature updates, device synchronization, etc. This project is a small implication of our concept in automating and monitoring a system. The practical applications of this project are immense and can have vast level of implementation. This small concept can be used in fields such as weather forecasting, remote sensing, robotics, aeronautics, home automation, and many other related fields where continuous monitoring and regulation is needed. The project work in the fact gives a lot of confidence to fight out in this challenging world. As one proceeds one cannot believe how much knowledge he/she gains and the teamwork, which the project work teaches, really will have a new experience.

Reference

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