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THE MINE ENVIRONMENT MONITORING SYSTEM BASED ON WIRELESS SENSOR NETWORKS

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Abstract: *The paper introduces a wireless sensor network platform specifically designed for the protection of workers employed in the building sector, exposed to critical physical agents, typical of their working scenario. In this project to overcome the problems we used wireless technology for tracking the workers. For this purpose a small RF transmitter module is equipped to each person entering a mine. Each transceiver placed in the working place look after the location of workers. The transceivers communicate with base stations through ZigBee module. In addition to the protection of workers we include sensors such as temperature and humidity to intimate the base station & workers when some atmosphere changes occur. Operators are now able to monitor the real-time locations of each miner to better pinpoint their locations in the event of an emergency. Even after a full-day of use, mine operators can locate an individual miner within ten feet.*

Keywords: *ARM7, ZigBee, WSN, Visual basic, voice module, temperature sensor and humidity sensor*

I.INTRODUCTION

Handheld devices such as Personal Digital Assistant (PDA) and smart phones are now widely used for many of our everyday tasks. However, there are at least two reasons that make the interaction on those devices difficult compared to desktop interfaces: small screen size and limited computing power. Pointing and scrolling are one of the most extensively used tasks in almost all computing applications. On the current touch screen and stylus based interfaces on handhelds, the user uses two hands for doing both of the tasks. Usually, the non-dominant hand holds the device and the dominant controls the stylus. The environment in which mobile devices are used is different from that in which desktop is used. The user needs to manage the environment while using the device: holding something, writing notes, opening doors, etc. Also, some users can not use both hands due to other reasons such as disability or accidents. So, we think that freeing one hand from interaction with the device is very useful. In this work, we study the use of tilt modality for pointing and scrolling on mobile devices. The technique requires only one hand and does not hide a part of the screen as in the case of using the Stylus. We evaluate the effectiveness of using tilting in the two tasks then a model for predicting their execution time is developed.

BLOCK DIAGRAM:

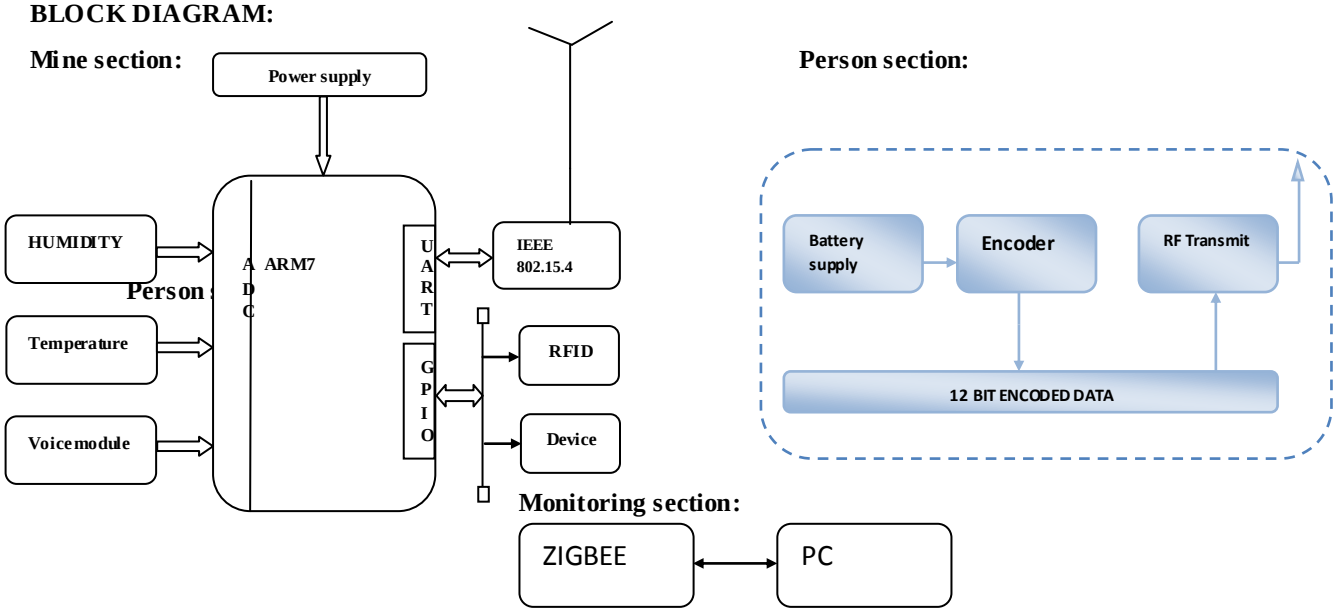


Fig1: Project block diagram

II. LITERATURE SUREY

A wireless sensor network (WSN) has important applications such as remote environmental monitoring and target tracking. This has been enabled by the availability, particularly in recent years, of sensors that are smaller, cheaper, and intelligent. These sensors are equipped with wireless interfaces with which they can communicate with one another to form a network. The design of a WSN depends significantly on the application, and it must consider factors such as the environment, the application's design objectives, and cost, hardware, and system constraints. The goal of our survey is to present a comprehensive review of the recent literature since the publication of, A survey on sensor networks, IEEE Communications Magazine, 2002. Following a top-down approach, we give an overview of several new applications and then review the literature on various aspects of WSNs. We classify the problems into three different categories: (1) internal platform and underlying operating system, (2) communication protocol stack, and (3) network services, provisioning, and deployment

III. IMPLEMENTATION OF PROJECT

In the project we having the three sections .they are Mine Section, Person Section, and Monitoring Section. The mine section will occur the humidity and temperature sensors ,voice module ,IEEE 802.15.4,RFID,power supply, device(door locking system) ,all the components to connected to ARM7 ,the power supply is on, The temperature and humidity sensors are produces the analog signal this signal will the converted into digital signal by the ARM7(LPC2148). The RFID Receiver RWS-434 modules do not incorporate internal decoding. If you want to receive Simple control or status signals such as button presses or switch closes, you can use the encoder and decoder IC set described above. Decoders with momentary and latched outputs are available. The RFID is the tag it will be use for the person entering purpose, and device will be based on the person identification only door will the open. IEEE 802.15.4 is the ZigBee it transmits the data collecting from sensors to Monitoring section. it transfer data within 10-100 feet's only..Range with maximum over the air data rate of 250 kbps is specified. Some coals may self-ignite at temperatures as low as 40 °C (104 °F) for brown coal in the right conditions of moisture and grain size if the temperature more than normal state in that state voice module will the help to miner because of through the speaker telling like the temperature exists vacate the coal mine.

In the person section will be Occur the RF transmitter, Encoder, battery Supply. The battery supply is given to RF transmitter, RF Transmitter TWS-434 extremely small, and is excellent for applications requiring short-range RF remote controls. These modules do not incorporate internal encoding. If simple control or status signals such as button presses or switch closures want to send, consider using an encoder and decoder IC set that takes care of all encoding, error checking, and decoding function. The transmitter output is up to 8mW at 433.92MHz.

The monitoring section will occur the ZigBee and PC .The ZigBee will collect information from the mine section and displaying the temperature and humidity values in personal computer. In this ZigBee to pc transmit the data purpose we are using the serial communication. The wireless Sensor network is composed of a large number of sensor nodes that are deployed in a wide area with very low powered sensor nodes. The wireless sensor networks can be utilized in a various information and telecommunications applications. The sensor nodes are very small devices with wireless communication capability, which can collect information about sound, light, motion, temperature etc and processed different sensed information and transfers it to the other nodes Self-configuration, Self-healing, Self-optimization, and Self-protection capabilities. Short-range broadcast communication and multi-hop routing .Dense deployment and cooperative effort of sensor nodes.

IV. HARDWARE

LPC2148 Microcontroller Architecture. The ARM7TDMI-S is a general purpose 32-bit microprocessor, which offers high performance and very low power consumption. The ARM architecture is based on Reduced Instruction Set Computer (RISC) principles, and the instruction set and related decode mechanism are much simpler than those of micro programmed Complex Instruction Set Computers (CISC). This simplicity results in a high instruction throughput and impressive real-time interrupt response from a small and cost-effective processor core. Pipeline techniques are employed so that all parts of the processing and memory systems can operate continuously. Typically, while one instruction is being executed, its successor is being decoded, and a third instruction is being fetched from memory. The ARM7TDMI-S processor also employs a unique architectural strategy known as Thumb, which makes it ideally suited to high-volume applications with memory restrictions, or applications where code density is an issue the key idea behind Thumb is that of a super-reduced instruction set. Essentially, the ARM7TDMI-S processor has two instruction sets.

The Thumb set's 16-bit instruction length allows it to approach twice the density of standard ARM code while retaining most of the ARM's performance advantage over a traditional 16-bit processor using 16-bit registers. This is possible because Thumb code operates on the same 32-bit register set as ARM code. Thumb code is able to provide up to

65 % of the code size of ARM, and 160 % of the performance of an equivalent ARM processor connected to a 16-bit memory system. 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 ARM7EJ-S processor is a synthesizable core that provides all the benefits of the ARM7TDMI – low power consumption, small size, and the thumb instruction set – while also incorporating ARM's latest DSP extensions and Jazelle technology, enabling acceleration of java-based applications. Compatible with the ARM9™, ARM9E™, and ARM10™ families, and Strong-Arm® architecture software written for the ARM7TDMI processor is 100% binary-compatible with other members of the ARM7 family and forwards-compatible with the ARM9, ARM9E, and ARM10 families, as well as products in Intel's Strong ARM and xscale architectures. This gives designers a choice of software-compatible processors with strong price-performance points. Support for the ARM architecture today includes

- Operating systems such as Windows CE, Linux, palm OS and SYMBIAN OS

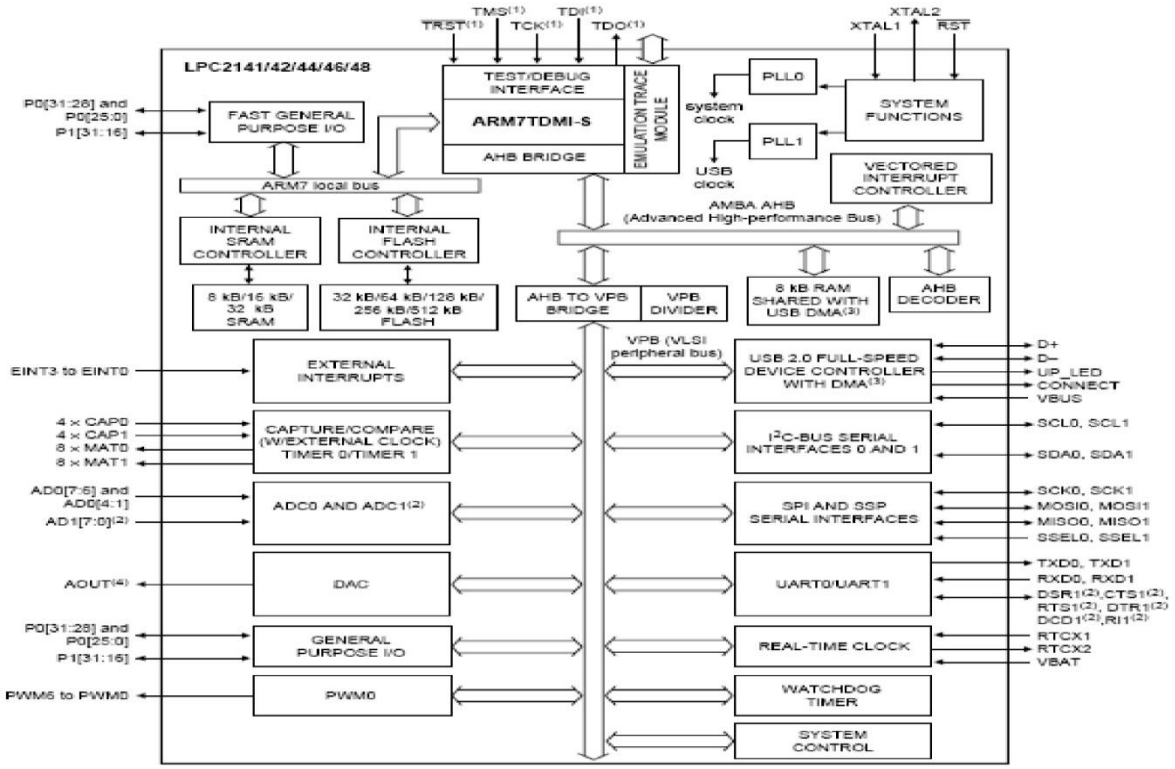


Fig 2. LPC2148 Architecture

V. TEMPERATURE SENSOR

The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ° Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full −55 to +150°C temperature range. Low cost is assured by trimming and calibration at the wafer level. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only 60 µA from its supply, it has very low self-heating, less than 0.1°C in still air. The LM35 is rated to operate over a −55° to +150°C temperature range, while the LM35C is rated for a −40° to +110°C range (−10° with improved accuracy). The LM35 series is available packaged in hermetic TO-46 transistor packages, while the LM35C, LM35CA, and LM35D are also available in the plastic TO-92 transistor package. The LM35D is also available in an 8-lead surface mount small outline package and a plastic TO-220 package.

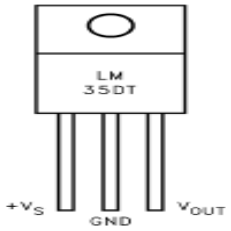


Fig 3.Temperature sensor

VI. INFRARED SENSOR

IR LED at 900nm-GaAlAs Infrared Light Emitting Diode-Shines invisible IR light on the user's eye.IR 900nm sensor .Light Detector, Detects reflected IR light. We decided to use blinking as we wanted the device to be functional for non-vocal or ventilated users (blowing or sucking was another option). Our first idea, and the one we implemented, was to use a led/photodiode pair to reflect light off the eye. We found that Optek Inc. makes a round receiver, consisting of a LED and a photo transistor mounted on the same unit. This detected a strong increase in signal upon blinking. We were worried about detecting the difference between normal and intentional blinks, but we found that for most users the intentional blinks produced a much stronger signal, and they were always much longer the ~300ms normal blink duration
SIGNAL CONDITIONER

A signal conditioner is a device that converts one type of electronic signal into another type of signal. Its primary use is to convert a signal that may be difficult to read by conventional instrumentation into a more easily read format. In performing this conversion a number of functions may take place. They include:

Amplification

When a signal is amplified, the overall magnitude of the signal is increased. Converting a 0-10mV signal to a 0 -10V signal is an example of amplification.

Electrical Isolation

Electrical isolation breaks the galvanic path between the input and output signal. That is there is no physical wiring between the input and output. The input is normally transferred to the output by converting it to an optical or magnetic signal then it is reconstructed on the output. By breaking the galvanic path between input and output, unwanted signals on the input line are prevented from passing through to the output. Isolation is required when a measurement must be made on a surface with a voltage potential far above ground. Isolation is also used to prevent ground loops

VII. ZIGBEE

The 802.15.4 standard specifies that communication should occur in 5MHZ channels ranging from 2.405 to 2.480 GHZ. In the 2.4GHZ Band, a maximum over the air data rate of 250 kbps is specified, but due to the overhead of the protocol the actual theoretical maximum data rate is approximately half of that .The 802.15.4 Standard allows for communication in a point-point or a point to multi point configuration ZigBee protocol and support the unique needs of low-cost, low-power wireless sensor networks. The modules require minimal power and provide reliable delivery of data between remote devices

ZigBee is a low power spin off of Wi-Fi. It is a specification for small, low power radios based on IEEE 802.15.4 – 2003 Wireless Personal Area Networks standard.

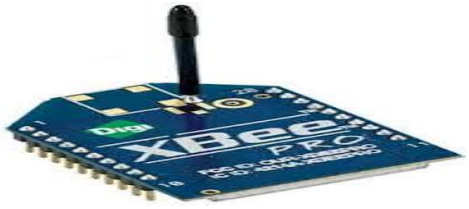
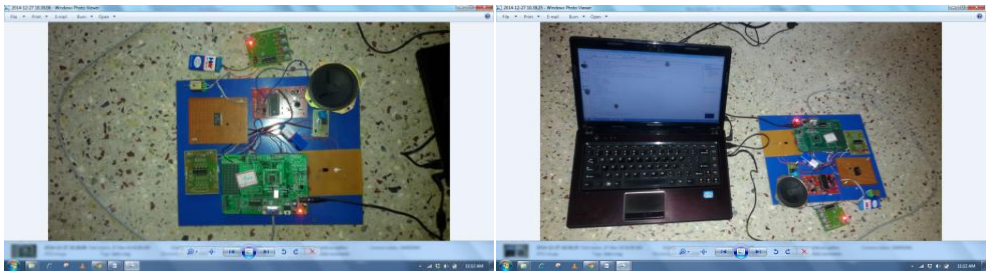
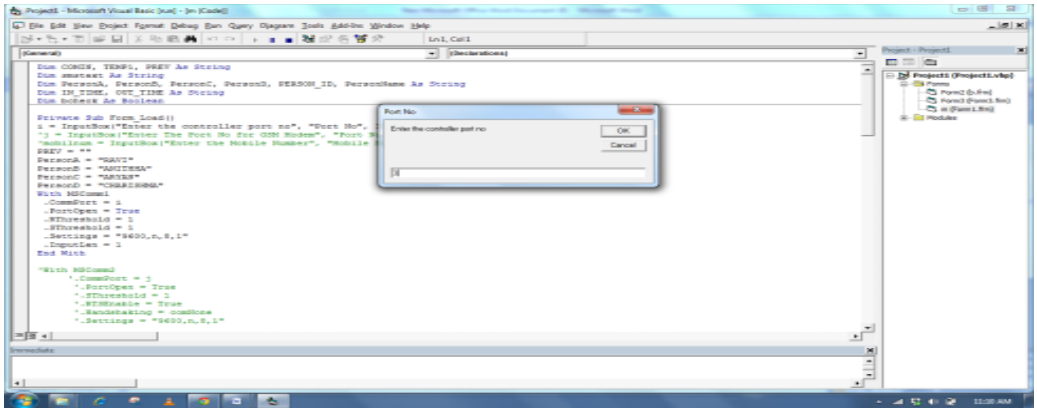


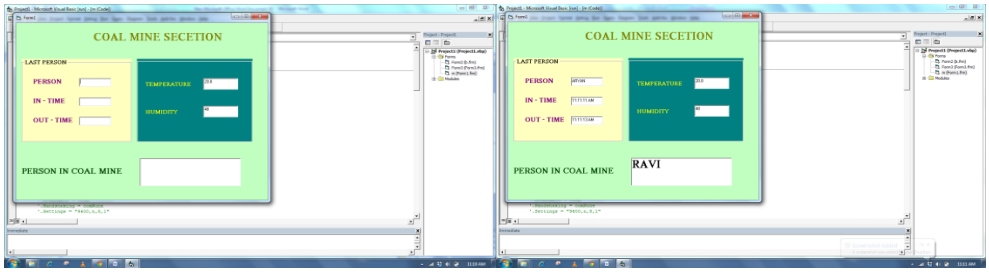
Fig 6 .Zigbee

ZigBee Alliance is a group of more than 300 companies including industry majors like Philips, Mitsubishi Electric, Epson, Atmel, Texas Instruments etc.

VIII. RESULT







IX. CONCLUSION

In this project mine environment monitoring system Based on wireless sensor networks (WSNs) using ZigBee is designed. The wireless part of the underground will be having the sensors for collecting the information. Sensor nodes are responsible for the collection of environmental parameters, and sending the collected data. Sensor nodes were arranged under tungsten mine flexibly. It transferred various safety indicators within the mine to the controller section, and then via transmission network uploaded the data to the ground monitoring centre by the ZigBee communication.

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