

HUMAN SAFETY IN MINING USING WIRELESS SENSOR NETWORK

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ABSTRACT

Industrial safety is one of the main aspects of industry specially mining industry. In the mining industry safety is a very vital factor. To avoid loss of material and damaging of human health, protection system as well as faithful communication system is necessary inside the underground mines. To increase both safety and productivity in mines, a reliable communication must be established between workers, moving in the mine, and a fixed base station. Inside mines, the wired communication system is not so effective, because of wires can be damaged inside mines. In this project we are going to monitor the Mine parameters like abnormal gas, temperature and heart rate, pressure to avoid the harmful gas or high temperature attacking the Mine workers.

Key Words: Automation, Wireless sensor, alert system, GSM, Lora.

I. INTRODUCTION

An embedded system is a controller programmed and controlled by a real-time operating system (RTOS) with a dedicated function within a larger mechanical or electrical system, often with real-time consumption of embedded systems computing constraints. It is embedded as part of a complete device often including hardware and mechanical parts. Embedded systems control many devices in common use today. Ninety-eight percent of all microprocessors are manufactured to serve as embedded system component.

Examples of properties of typical embedded computers when compared with general-purpose counterparts are low power consumption, small size, rugged operating ranges, and low per-unit cost. This comes at the price of limited processing resources, which make them significantly more difficult to program and to interact with. However, by building intelligence mechanisms on top of the hardware, taking advantage of possible existing sensors and the existence of a network of embedded units, one can both optimally manage available resources at the unit and network levels as well as provide augmented functions, well beyond those available. For example, intelligent techniques can be designed to manage power

II. PROPOSED SYSTEM

In this system, the basic parameters like temperature, humidity and hazardous methane gas are going to be monitored. For that we are having system with Microcontroller, in that the sensors are interfaced with it. Industrial safety is one of the main aspects of industry specially mining industry. In the mining industry safety is a very vital factor. To avoid loss of material and damaging of human health, protection system as well as faithful communication system is necessary inside the underground mines. To increase both safety and productivity in mines, a reliable communication must be established between workers, moving in the mine, and a fixed base station. Inside mines, the wired communication system is not so effective, because of wires can be damaged inside mines.

III. EXISTING SYSTEM

In traditional method the abnormal in any of the parameters are transmitted in wireless communication to intimate the status to monitoring section. Manually controlled one.

IV. HARDWARE DESCRIPTION

ARDUINO UNO

The Arduino Uno is a microcontroller board based on the ATmega328 (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started. The Uno differs from all preceding boards in that it does not use the FTDI USB-to-serial driver chip. Instead, it features the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. Revision 2 of the Uno board has a resistor pulling the 8U2 HWB line to ground, making it easier to put into DFU mode

Memory

The ATmega328 has 32 KB (with 0.5 KB used for the bootloader). It also has 2 KB of SRAM and 1 KB of EEPROM (which can be read and written with the EEPROM library). Input and Output Each of the 14 digital pins on the Uno can be used as an input or output, using pin Mode(), digital Write(), and digital Read() functions. They operate at 5 volts. Each pin can provide or receive a maximum of 40 mA and has an internal pull-up resistor (disconnected by default) of 20-50 kOhms.

HEART BEAT SENSOR:

A person's heartbeat is the sound of the valves in his/her's heart contracting or expanding as they force blood from one region to another. The number of times the heart beats per minute (BPM), is the heart beat rate and the beat of the heart that can be felt in any artery that lies close to the skin is the pulse. Ways to Measure a Heartbeat

TEMPERATURE SENSOR:

'The world is getting warmer day by day.' This sentence has started to crop up every now and then in our day to day lives. But seldom do we wonder what it means. What is warmer? How warm is warm? Is it hotter than hot, or just hotter than cold? To our human senses, temperature is only a subjective evaluation. For an objective and reproducible measurement, we need to quantify the temperature values, and to do that, a suitable measurement device is required

PRESSURE SENSOR:

A **pressure sensor** is a device for pressure measurement of gases or liquids. Pressure is an expression of the force required to stop a fluid from expanding, and is usually stated in terms of force per unit area. A pressure sensor usually acts as a transducer; it generates a signal as a function of the pressure imposed. For the purposes of this article, such a signal is electrical.

Pressure sensors are used for control and monitoring in thousands of everyday applications. Pressure sensors can also be used to indirectly measure other variables such as fluid/gas flow, speed, water level, and altitude. Pressure sensors can alternatively be called **pressure transducers**, **pressure transmitters** **pressure senders**, **pressure indicators**, **piezometers** and **manometers**, among other names.

Pressure sensors can vary drastically in technology, design, performance, application suitability and cost. A conservative estimate would be that there may be over 50 technologies and at least 300 companies making pressure sensors worldwide.

Vibration Motors

There are two basic types of vibration motor. An **eccentric rotating mass vibration motor (ERM)** shown in Fig.NO.4.7 uses a small unbalanced mass on a DC motor when it rotates it creates a force that translates to vibrations. A **linear resonant actuator (LRA)** contains a small internal mass attached to a spring, which creates a force when driven. As specialists in the supply and design of vibration motor you can find our stocked motors in our product catalogue you can't find exactly what you need or would like to discuss a project, please do not hesitate to contact our engineers here. If you prefer to read online, you will find lots of additional information and guides to help you understand how vibration motors work.

BUZZER

A **buzzer** or **beeper** is an audio signaling device, which may be mechanical, electromechanical, or piezoelectric (*piezo* for short). Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

PANIC BUTTON:

A **panic alarm** system usually consists of a **button** which, when pressed, activates the **alarm** by sending a signal to either the local emergency team, e.g. the police, or to a monitoring service. Then a communication system, usually via control panels and signaling devices, summons help when the **alarm** is activated.

GSM:

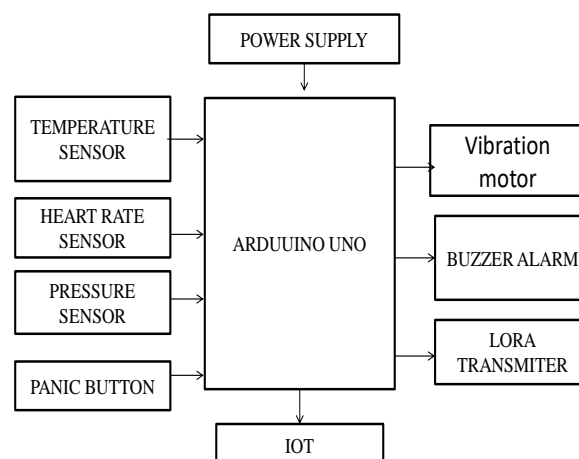
GSM (Global System for Mobile communications) is a standard developed by the European Telecommunications Standards Institute (ETSI) to describe the protocols for second-generation (2G) digital cellular networks used by mobile devices such as tablets. It was first deployed in Finland in December 1991.^[2] As of 2014, it has become the global standard for mobile communications – with over 90% market share, operating in over 193 countries and territories.^[3]

2G networks developed as a replacement for first generation (1G) analog cellular networks, and the GSM standard originally described a digital, circuit-switched network optimized for full duplex voice telephony. This expanded over time to include data communications, first by circuit-switched transport, then by packet data transport via GPRS (General Packet Radio Services) and EDGE (Enhanced Data rates for GSM Evolution, or EGPRS)

LORA

LoRa (short for long range) is a spread spectrum modulation technique derived from chirp spread spectrum (CSS) technology. Semtech's LoRa devices and wireless radio frequency technology is a long range, low power wireless platform that has become the de facto technology for Internet of Things (IoT) networks worldwide. LoRa devices and the open LoRaWAN® protocol enable smart sIoT applications that solve some of the biggest challenges facing our planet: energy management, natural resource reduction, pollution control, infrastructure efficiency, disaster prevention, and more. Semtech's LoRa devices and the LoRaWAN protocol have amassed several hundred known uses cases for smart cities, smart homes and buildings, smart agriculture, smart metering, smart supply chain and logistics, and more. With well over 100 million devices connected to networks in 100 countries and growing, LoRa devices are the DNA of IoT, creating a Smarter Planet.

Tramitting Side



RecevierSide

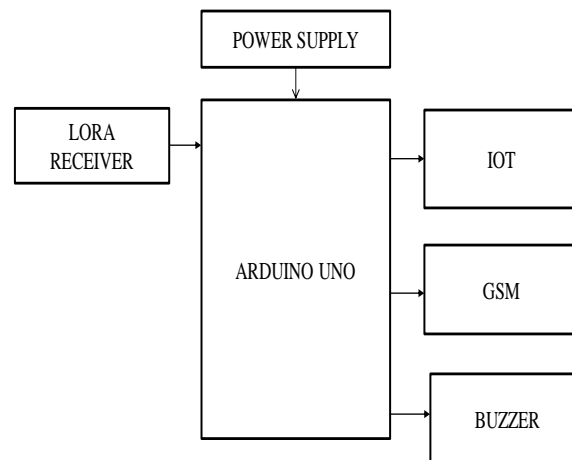


FIGURE.2. BLOCK DIAGRAM OF RECEIVER

V. SOFTWARE DESCRIPTION

ARDUINO IDE:

The Arduino IDE is incredibly minimalistic, yet it provides a near-complete environment for most Arduino-based projects.

The top menu bar has the standard options, including “File” (new, load save, etc.), “Edit” (font, copy, paste, etc.), “Sketch” (for compiling and programming), “Tools” (useful options for testing projects), and “Help”.

The middle section of the IDE is a simple text editor that where you can enter the program code.

The bottom section of the IDE is dedicated to an output window that is used to see the status of the compilation, how much memory has been used, any errors that were found in the program, and various other useful messages.

EMBEDDED C:

Embedded C is most popular programming language in software field for developing electronic gadgets. Each processor used in electronic system is associated with embedded software.

Embedded C programming plays a key role in performing specific function by the processor. In day-.to-day life we used many electronic devices such as mobile phone, washing machine, digital camera, etc. These all device working is based on microcontroller that are programmed by embedded C.

The Embedded C code written in above block diagram is used for blinking the LED connected with Port0 of microcontroller.

In embedded system programming C code is preferred over other language. Due to the following reasons:

- Easy to understand

- High Reliability
- Portability
- Scalability

Function is a collection of statements that is used for performing a specific task and a collection of one or more functions is called a programming language.

Most consumers are familiar with application software that provide functionality on a computer. Embedded software however is often less visible, but no less complicated. Unlike application software, embedded software has fixed hardware requirements and capabilities, and addition of third-party hardware or software is strictly controlled.

Embedded software needs to include all needed device drivers at manufacturing time, and the device drivers are written for the specific hardware. The software is highly dependent on the CPU and specific chips chosen. Most embedded software engineers have at least a passing knowledge of reading schematics, and reading data sheets for components to determine usage of registers and communication system. Conversion between decimal, hexadecimal and binary is useful as well as using bit manipulation. [7]

Web applications are rarely used, although XML files and other output may be passed to a computer for display. File systems with folders are typically absent as are SQL databases.

Software development requires use of a cross compiler, which runs on a computer but produces executable code for the target device. Debugging requires use of an in-circuit emulator, JTAG or SWD. Software developers often have access to the complete kernel (OS) source code.

VI. WORKING MODULE

The parameters of the mine workers are given as input to the Arduino UNO, all the data are transferred to LoRa transmitter, and these data are stored in cloud. At the receiver, the parameters are received by means of wireless network and monitored through IOT. If any parameters exceeds the threshold value, then an alert signal is given to the mine worker by means of a buzzer and vibration motor. If any trouble is guess by the mine worker, then they give alert by means of panic button.



Figure.3.Hardware Set-up



Figure.4. Image of Message Notification

VII. MODULES

- IOT
- Buzzer and Vibration Motor Alert
- Message notification
- Efficiency and Throughput Accuracy Calculation

VIII. MODULES DESCRIPTION

IOT

The term Internet of Things generally refers to scenarios where network connectivity and computing capability extends to objects, sensors and everyday items not normally considered computers, allowing these devices to generate, exchange and consume data with minimal human intervention. There is, however, no single, universal definition

BUZZER AND VIBRATION MOTOR ALERT

There are two basic types of vibration motor. An **eccentric rotating mass vibration motor (ERM)** uses a small unbalanced mass on a DC motor when it rotates it creates a force that translates to vibrations. A **linear resonant actuator (LRA)** contains a small internal mass attached to a spring, which creates a force when driven.

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MESSAGE NOTIFICATION

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IX. ADVANTAGES OF THE PROPOSED SYSTEM

- It offers reliability.
- Immediate alert system.
- We can able to alert the people using IOT technology.

X. REFERENCE

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