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EMBEDDED BASED HIGH PERFORMANCE WORK WEAR FOR COAL MINER

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ABSTRACT

This project tackles the problem of coal mine accidents which results in the death of several people per year. It is found out that the rate of fatality in the coal mine industry is nearly six times the rate for all private industry. And most of these accidents are due to toxic gasses, fires and lack of rescue system. By implementing a Coal Mine Safety jacket, which can used in the mine and detect the level of different gases, respiration, vibration and temperature level and report them live to the control room using IOT. Shock prevention is used to avoid shock using automatic trip off at working areas.

KEYWORDS: Microcontroller, smart cloth, sensors, coal mine.

INTRODUCTION

The need for real-time information technology on the industrial safety has been well documented. Smart clothing materials are passive and the ability to integrate electronics into textiles provides the potential to achieve revolutionary improvements in performance and the realization of capabilities never before imagined on the work field. Electronic devices are being miniaturized personal use both in the commercial and military sectors. Narrow woven technology was selected as one of the most promising textile manufacturing methods. Two selected military applications are textile-based cables to support a wearable electronic network providing data and power transport, and embedded system that helps to view the parameters. Projected capability enhancements on the field provided by these products include an individual soldier network to process and use information in real time resulting in increased situational awareness and enhanced communications.

NEED OF SMART CLOTH FOR COAL MINERS

There are mainly two methods for extracting the coal from earth- surface mine and underground mine. Most of surface mines are open pit or open cast mine. The surface mine are entirely open and operated from the surface of the earth. The advantages of surface mines are high productivity, low operating cost and good safety condition. Most of the coal is extracted using surface method. In case coal is very deep from surface underground method is used. The underground mines are supported or unsupported mines. In supported method used artificial pillars for support of the opening. Supported mining methods are often used in mines with weak rock structure. The artificial supports are does not available for unsupported mining method. Unsupported methods are used in those areas where strong rock structure available. Underground coal mining involves a higher risk than surface mining due to the problems of ventilation and potential for collapse. The maximum accident occurs in underground mines. In mining industry worker safety is very important issue. Every year, thousands of miners die in accidents and many more get injured, especially in the processes of coal mining and hard rock mining. The main reasons of accidents are gas or dust explosions, gas intoxications, improper use of explosives, electrical burn, fires,

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collapsing of mine structures, rock falls from roofs and side walls, flooding, workers stumbling/slipping/falling, or errors from malfunctioning or improperly used mining equipment. In coal mine use of personal protective equipment like helmet, shoes etc. are not proper and proper arrangements were not there to check if the person is wearing personal protective equipment or not . The proper supervision for worker wear the protective equipment is very important factor for consideration. Underground mines are very dark so any miners are fall unconscious because of suffocation or falling of structure, supervisor don't known about her health condition and proper treatment is not provided her in time. The main reason for miner death is harmful gases explosions. In coal mines carbon monoxide, methane, LPG gases are existing and they are very harmful for human body.

LITERATURE SURVEY

Before initiating for designing an autonomous system which may detect the parameters related to the miner who is working in local mines of Pakistan; it was very important to study the previous suggested systems being proposed in past for same issue and do comparative analysis. There are huge manuscripts available describing the same autonomous systems by which one can get an accurate and exact situation awareness along with alert generation for rescue teams. One may get a rapid support from data acquiring if it is done through pervasive or ubiquitous computing technology. This will not only increase the computational capability for communicating but it will also provide an ease to perform useful tasks that minimizes the less interaction with computers.

In some of literature, the usage of audio communication is also proposed but this may create an overload and a confusion for rescuers as this system design is proposed to provide an easy way out for rescuers to set a priority to dig at particular places where one may find maximum chances to retain the live of a miner . Moreover, there are several systems, which are easy to carry, and wearable i.e. a wrist band using Arduino Platform for the rescuer . The main objectives of various papers are related to generating an alert to rescue team using android applications [4] but what rescue team will do if they do not know where the exact miner is lying beneath the debris. Discussing some of very sensitive solutions i.e. designing of incubators where proper data acquisition and transmitting that wirelessly both are challenging tasks but yet one may find various systems being designed on micro-controller based and receiving some of essential data . Being an engineer, people expect us to provide a solution which should be under community services and due to this various research scholar strive hard to proposes various solutions.

Discussing further one may see such autonomous systems which may not only detect the various gases using Average Slope Multiplication techniques. In Proposed papers there are plenty of papers which will not only detect the gas leakage but recognize it as well i.e. Methane or any hazardous or poisonous gases which may harm the labor inside a drain line or in mines in our case. The main issue in the establishment of such an underground monitoring system is to have a communication alive and in this regard one may explore the use of low frequency magnetic fields for communication, and present a new hardware platform that features triaxle transmitter/receiver antenna loops. Furthermore, one may study the literature related to MEMS based sensors which are used to monitor the underground parameters as per the requirement; several systems are suggested which are mostly based on digital communication and are based on IEEE 802.15.4 standard which describes the operation of low rate wireless area network. In the field of robotics, various manuscript suggests the same rescue strategy using robots. In such manuscripts all rescue & surveillance activities such as the detection of explosion, leakage of gases all are done using various types of robots

DRAWBACKS OF EXISTING SYSTEM

- The persons who are working in the coal mining has to face various environmental parameters in their mining.
- There is no wearable sensor for monitoring
- They have the danger from the methane, carbon monoxide, and temperature.

PROPOSED METHOD

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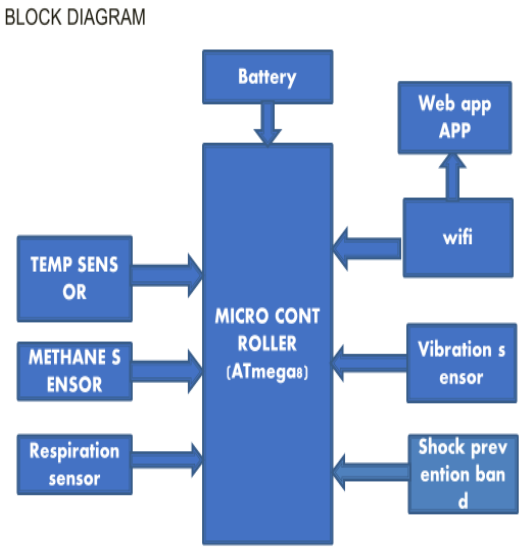

Fig 1: Proposed Block diagram

PROPOSED SYSTEM

- Here we are going to use IOT technology sensors like temperature , RESPIRATION ,gas, vibration sensor
- sensors will observe the change in environment parameters and they will give the information to micro controller .
- Then micro controller will Verify this values up to date, if any of the value exceeds than rated it will alert to person through the buzzer.
- This information is passed to the base station through the IOT module.
- Then the department at the base station will take saftey precautions to safe the persons who are working in the coal mining.

ADVANTAGES

- Safety monitoring of the environment.
- Improved Services in coal mining.
- Providing Wireless connection security
- Faster Checked Out/In
- Prevent from the high temperature, humidity and harmful gases
- Quick Searching and can able to give the warning.
- Cost Avoidance.

MICROCONTROLLER
Description

The ATmega8 is a low-solar power CMOS 8-bit microcontroller based on the AVR RISC architecture. By executing solar powerful instructions in a single clock cycle, the ATmega16 achieves throughputs approaching 1 MIPS per MHz, allowing the system designed to optimize solar power consumption versus processing speed. The AVR core combines a rich instruction set with 32 general-purpose working registers. All the 32 registers are directly connected to the Arithmetic Logic Unit (ALU), allowing two independent registers to be accessed in one single instruction executed in one clock cycle. The resulting architecture is more code efficient while achieving throughputs up to ten times faster than conventional CISC microcontrollers.

The device is manufactured using Atmel's high-density non-volatile memory technology. The Flash Program memory can be reprogrammed In-System through an SPI serial interface, by a conventional non-volatile memory programmer, or by an On-chip boot program running on the AVR core. The boot program can use any interface to download the application program in the Application Flash memory. Software in the Boot Flash Section will continue to run while the Application Flash Section is updated, providing true Read-While-Write operation. By combining an 8-bit RISC CPU with In-System Self- Programmable Flash on a monolithic chip, the Atmel ATmega8 is a solar powerful microcontroller that provides a highly flexible and cost-effective solution to many embedded control applications. The ATmega8 AVR is supported with a full suite of program and system development tools, including C compilers, macro assemblers, program debugger/simulators, In-Circuit Emulators, and evaluation kits.

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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 ±1/4°C at room temperature and ±3/4°C over a full -55 to +150°C temperature range.

ESP32-CAM Module Side

The libraries used when developing the ESP32-CAM module are as follows: “esp_camera.h”, “WiFi.h”, “ArduinoWebSockets.h” and “camera_pins.h”. The camera model of the module has been chosen as CAMERA_MODEL_AI_THINKER. The service set identifier (SSID) and the password of the modem to which the camera module is connected are set by default in the Arduino code development. To send data from the module to the Web Server, the host and port number of the Websocket have been determined. The IP address to host the Websocket has been provided. While determining this IP address, "ipconfig" command was run on the device that is running a Web Server (this device is a Windows 10 desktop). The "IPv4 address" obtained as a result of executing “ipconfig” command is the address that hosts the Websocket. The specified Websocket server port number in the Arduino code is 8888. Subsequently, the client object for the Websocket is created in "WebSocket Client" type. After necessary configuration settings and parameters are set for the camera module, a successful connection of the module to the web server is ensured. Subsequently, the websocket server host address (IPv4 address) and the specified websocket server port provide a connection to the websocket client. After the connection is successful, the camera is ready to send data to the server. At this point, modifications of the data are required for shifting data transmission. The data type received from the camera module is in a special struct like “camera_fb_t”. The “buf” parameter of this struct corresponds to the pixel data received from the camera. The raw form of the data taken from the camera is in “char” pointer type. When a 32-bit left shift operation is applied to this data, the payload (i.e. real-time streaming data) coming from the camera becomes incomprehensible. After the shift operation, the client is in binary type; the shifted payload and the size of this payload are sent.

LIVE STREAMING

Video transmission and display process on most systems are very important. In this study, it is aimed to make a secure video or image transfer system. To achieve this goal, the image must first be taken by ESP32-CAM module. This module acts as a data provider. The feature has been installed when customizing the module for this usage. To display the image taken from the module, it joined to a common network. When the ESP32-CAM module is connected to a common network, it provides an Internet protocol (IP) address to broadcast. This network is a common network, including the Web Server. Within the scope of this study, the ESP32-CAM module and the desktop computer where the Web Server is installed are connected to the same access point. The user that we assume as an observer, connects to an access point via his/her computer. This access point is the same device that the ESP32-CAM and Web Server Provider Device connects to. In this way, both the observer and the camera module are connected to the same network. Once this partnership is achieved, the logs are observed in the web browser with the IP address provided by the ESP32-CAM.

CONCLUSION

Thus the proposed method for adding addditonal features to the coal miners uniform has been implemented successfully. Electronic textiles were manufactured using commercially available materials and traditional textile manufacturing methods. Conductive materials such as copper wire, tinsel wire, and optical fiber were integrated into double plain weave narrow fabrics. Stranded copper wire filaments less than 44–46 AWG in size were found to be the most cost effective. Narrow woven electro textile cables may be used to create continuous network on or within a military garment or clothing system without seam discontinuities. A double plain weave narrow fabric with \ integrated conductive components was manufactured that met selected test requirements of the USB 2.0 initially, and after exposure to abrasion and cyclic loading. A radiating narrow fabric with integrated conductive and optical materials was manufactured that demonstrated communications ranges compatible with military communications equipment.

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