Automation In Mines Using Voice Alert To Ensure The Safety Of Workers

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ABSTRACT: Mining is one of the most dangerous industries in the world. Frequently we here the accidents taking place in mines. The life of workers hence is at a great risk. A reliable system is therefore needed to establish an adequate communication between the mines and the monitoring section. The wireless sensors and the voice alert along with RFID risks involved and take appropriate measures. The presence of any harmful gas can also be detected with the system by tags installed at various places in the mines. This saves the personnel from life threatening situations.

Keywords: Voice alert, RFID, 2-Axis robot, PIC microcontroller

1 INTRODUCTION

In spite of the continuous efforts to improve adverse conditions in mines, the lack of an efficient and precise system makes it hard for the workers to carry out their jobs with comfort. The earlier systems lacked voice alert and hence the delay in the warning system which did not contribute in improving the situations in mines significantly. In our paper we have introduced voice alert for the fast and accurate delivery of any warning regarding any abnormality. The wireless sensing technology has been improved over time by reduced sensor cost, size and increased functionalities. Technologies such as WSN, BIM and ERP have been used in earlier systems which have helped the mines in their own ways. The ERP systems however lack on capturing and automated updating of data which is a huge drawback. The LCD and Zigbee used in our paper fulfil the criteria for the effective system needed in mines to ensure safety. The smart RFID tags or the active tags are used for monitoring the environmental parameters. The earlier tags had many demerits such as short range, not suitable in mining conditions, not economical and so on. RFID with its friendly features can prove to be very helpful in dealing the abnormalities in mines. The use of PIC microcontroller instead of the traditional 8051 microcontroller make the technology nothing but more responsive.

2 MATERIALS AND METHODS

The hardware equipments used in the paper are:

2.1 PIC 16F877A microcontroller:

Can detect up to 8 sensors and has an in built analogue to digital converter. They use Flash memory for program storage and can be reprogrammed.

2.2 RFID tags and readers:

The reader has an antenna which emits radio waves and the tag responds by sending back its data to the reader.

2.3 MAX 232:

The MAX232 is a dual driver/receiver that includes a capacitive voltage generator to supply RS 232 voltage levels from a single 5v supply.

2.4 LCD:

Based on Hitachi's HD44780 controller or other which are compatible with HD44580.

2.5 2-Axis robot (DC motor):

The ball bearing robot has been used in the paper which is guided by computer and electronic programming.

2.6 Temperature Sensor:

LM35 sensor has been used to detect temperature which gives electrical output proportional to the temperature in Celsius

2.7 Gas Sensor:

The sensor has two electrodes and an electrolyte and the ambient air is monitored through a porous membrane.

2.8 Zigbee:

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.

2.9 APR Voice playback:

APR9600 is a low-cost high performance sound record/replay IC incorporating flash analogue

2.10 Relay:

A relay is an electrically operated switch storage technique of frequencies 902-928 MHz and 868.0–868.6 MHz

2.11 Software:

The software used in the paper is Embedded C, MP Lab compiler and HyperTerminal.

3. RESULTS AND DISCUSSIONS

3.1 Power Supply Unit

Given Input: 230V, 5A, 50 Hz AC Supply Expected Output: 12V, 500mA- 1A, DC Voltage

3.2 PIC Microcontroller

Given Input: The input from the RFID reader is given as the input to the PIC controller.

Expected Output: The received input through reader is

processed and the detail is outputted as through the Speaker using APR voice play back and also it control the horn depends upon the sign.

3.3 GAS Sensor:

Given Input: GAS given as input for the sensor.

Expected Output: The gas sensor output will be in the form of analogue voltage with respect to the gas level.

3.4 Temperature Sensor:

Given Input: Environment temperature given as input for the sensor

Expected Output: The temperature sensor output will be in the form of analog voltage with respect to the temperature level.

3.5 RFID Reader:

Given Input: The RFID Tag unique number given as input to the RFID reader.

Expected Output: The received tag information is serially given to the microcontroller.

3.6 MAX 232:

Given Input: The input to MAX 232 is the information in TTL Level.

Expected Output: The output of the MAX 232 is the same information in RS232 level.

LCD:

Given Input: The text from the microcontroller indicating the device status is given as input to the LCD.

Expected Output: The received text is displayed on the LCD.

4. HELPFUL HINTS

4.1 FIGURES

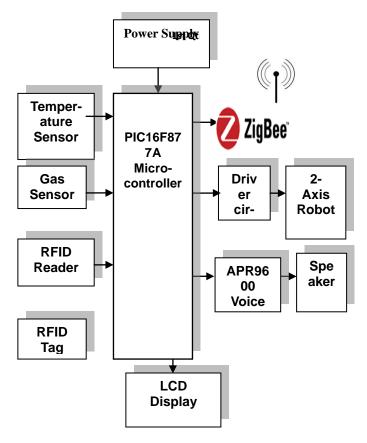


FIG 1: MINE SECTION

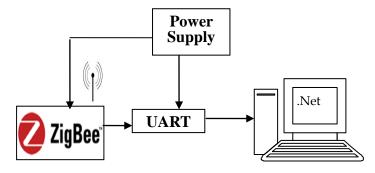


FIG 2: MINE SECTION

5 CONCLUSION

This technique plays a vital role in the industry for safety actions. Voices play back IC is used to intimate the problem immediately. Therefore the safety of workers in mines is ensured to a great extent. It avoids freaky accidents and loss of damages. Technologies chosen are appropriate and can further be improved by advanced level of RFIDs and microcontrollers.

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