Mining Workers Impact Detection and alerting System

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Abstract— Mining workers impact detection and alerting system used to rescue miners by sending information by using ESP8266 and detected by using some sensors. the current economic situation and the growth in world demand, the mining industry is undergoing a period of spectacular development. The current need to increase production at mine sites coincides with the development of managerial capacities, the use of new industrial methods and equipment, and increased use of skilled workforce. Despite such developments, a number of researchers view the min-ing sector among the world's most uncertain and hazardous industries. Although the sector utilizes risk management tools appropriately, several large-scale mining projects have failed as a result of neglect or underestimation of hazards. Total risk management of a new project remains a goal to be attained so as to enhance reliability of decisions and make mining organizations safer and more secure.The intent of this paper is to provide researchers and practitioners a preliminary portrait of the risks related to new mining projects. To attain this objective, the authors have primarily used results from research undertaken in the field. They completed this portrait using the results of hazard identification studies that they conducted in an open-pit mining project in Quebec. During this study, a number of data-gathering techniques were used, including documentation analysis, collaborative field observations, and interviews with managers and workers . This work demonstrates the possibility of identifying a number of categories of known risks and uncertainties not recently taken into account in any systemic or systematic way in mining project risk management. In this paper, identified risks are categorized hierarchically to show the impact and possibility of occurrence of each for every project phase. Despite having a number of limitations, this study enables construction of a risks portrait indispensable for completing a reliable and rapid assessment of mining project hazards.

INTRODUCTION

Mining accident is an accident that occurs during the process of mining minerals and metals. Thousands of miners die from mining accidents each year, the main reason for the workers dying is that those workers are unable to detect the problem. According to ministry data, out of the total deaths, over 549 deaths were reported from mines. Several experts say a lack of investment in coal mines is one of the main reasons for the industry's high casualty rate. Accidents during surface transport by heavy machinery in open-cast mines, and the use of explosives, are the other key reasons.. The main objective of the project is to reduce the mining area death and to rescue the workers quickly, indicate the soil and rock sliding underground area and update the mining area Surrounding volumes like temperature, pressure, oxygen level and produced gasses.These processes are updated in the monitoring room of mining head by using wi-fi and GSM module.

I. REQUIRED COMPONENTS

The required components are ESP8266, Temperature sensor (DHT-11), Pressure sensor(HX710B),Gas sensor(MQ-135), Vibration sensor(SW18015P), Buzzer, OLED Display, LED, Jumper wire.

II. DESCRIPTION

A. **ESP8266** is a low cost, high performance, low power consumption This is a low cost, high performance, low power consumption, easy to program, wireless SoC (System-On-Chip). It provides capabilities for 2.4 GHz Wi-Fi (802.11 b/g/n, supporting WPA/WPA2), general-purpose input/output (13 GPIO), Inter-Integrated Circuit (I²C), analog-to-digital conversion (10-bit ADC), Serial Peripheral Interface (SPI), I²S interfaces with DMA (sharing pins with GPIO), UART (on dedicated pins, plus a transmit-only UART can be enabled on GPIO2), and pulse-width modulation (PWM). It has a build-in programmer and a voltage regulator, that allow flashing and powering the device via micro-USB. It has 3.3V operating voltage, internal voltage regulator allows 5V on power input and weight is about 20g, Humidity range from 10%-90% of non-condensing and Temperature range from -40℃ ~ + 125 ℃.

B. **GAS DETECTOR SENSOR** is used to detect the dangerous LPG leaking in environmental air. The sensor output is the oxygen level in underground coal mining areas which is a digital value. The gas sensor module basically consists of 4 terminals as VCC and GND for power supply, Digital output pin gives an output either in logical high or logical low (0 or 1) that means it displays the presence of any toxic or combustible gases near the sensor. Analog output give an output continuous in voltage which varies based on the concentration of gas that is applied to the gas sensor. It is used in industries to monitor the concentration of the toxic gases.

C. **TEMPERATURE SENSOR** is used to measure the temperature of the environment and converts the input data into electronic data to record, monitor or signal temperature changes. A temperature sensor is a device that depend upon the voltage across the diode. The temperature change is directly proportional to the diode's resistance. The resistance across the diode is measured and converted into readable units of temperature (Fahrenheit, Celsius, Centigrade, etc.)

HUMIDITY SENSOR used for finding the amount of water vapor present in the air around the sensors. The amount of moisture in the gas can be a mixture of different elements including nitrogen, water vapor, argon, etc. Since humidity can have huge effects on different biological, chemical, and physical processes, it should be measured and controlled in different industries. These sensors have been designed for various applications to measure the humidity as well as the temperature of the environment

D. **PRESSURE SENSOR** consists of a piezo-resistive sensor, Analog to digital converter and a control unit with E2PROM and a serial I2C interface. The BMP180 delivers the uncompensated value of pressure. The microcontroller sends a start sequence to start a pressure measurement. Pressure sensing range from 300-1100hPa with Temperature range from -40 to +85°C operational range.

E. **OLED DISPLAY** is an Organic Light Emitting Diode popularly known as OLED is a solid-state device that consists of thin films of organic molecules that generate a bright light on the application of electric current. They are made by a series of organic thin films placed between two conductors. .

OLED displays are available in a range of sizes (such as 128×64, 128×32).

F. **BUZZER** is an audio signal device like a beeper or buzzer may be electromechanical or piezoelectric or mechanical type. The main function of this is to convert the signal from audio to sound. Generally, it is powered through DC voltage and used in timers, alarm devices, printers, alarms, computers, etc. Based on the various designs, it can generate different sounds like alarm, music, bell & siren
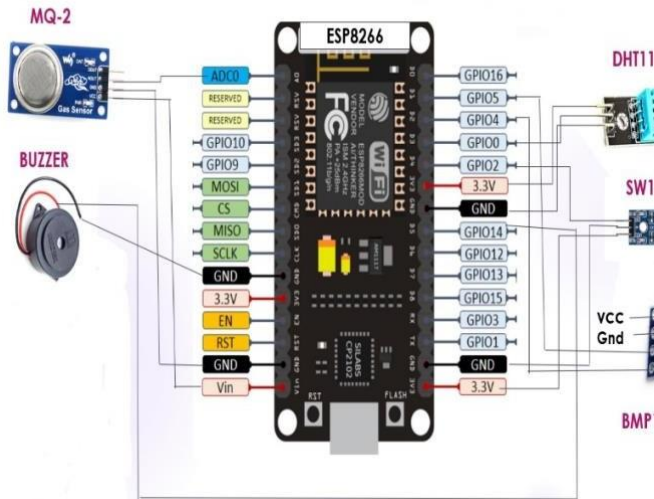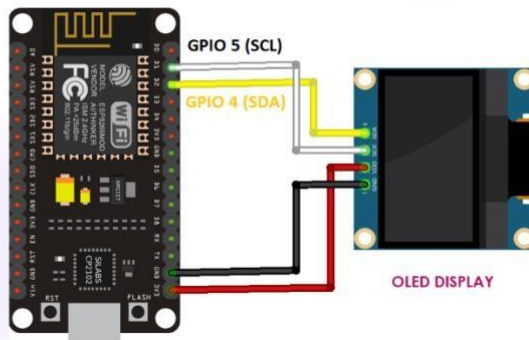

III. BLOCK DIAGRAM
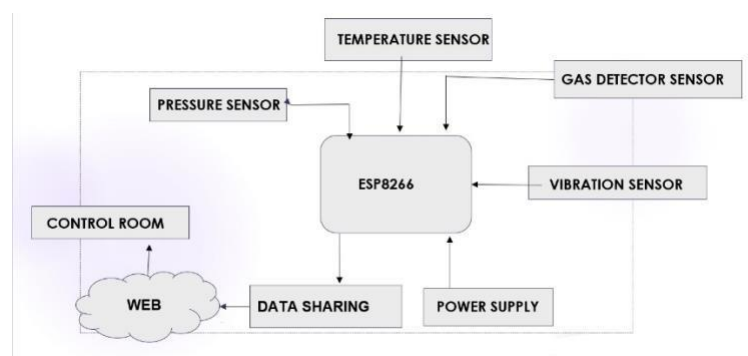
IV. CIRCUIT DIAGRAM

CIRCUIT DIAGRAM-PHASE-1:

PHASE-3:

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PHASE-2: