

Environment Monitoring In Underground Workers Safety and Communication through Wi-Fi Technology

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Abstract:

The proposed system is divided into two sections. First is a hardware circuit that will be attached with the body of the mine workers. This may be preferably fitted with the safety helmet of the workers also. The circuit has a sensor module consisting of some sensors that measures real-time underground parameters like temperature, humidity and gas concentration. Gas concentration is meant for the harmful gases like methane and carbon-monoxide. A microcontroller is used with the sensors to receive the sensor outputs and to take the necessary decision. Once temperature is more than the safety level preprogrammed at microcontroller, microcontroller decodes beep alarms through the headset speaker connected with controller once the measured humidity value is more than the safety level pre-programmed at microcontroller; it decodes different type of beep alarms. Similarly when gas concentration crosses the safety level, microcontroller decodes siren alarms. Different sensors values are displayed in the LCD of mine workers section. A voice announcement is given when the sensor levels exceed the threshold levels. In all such cases, this will send an alarm through an urgent message and alarm sound to the ground control terminal through ZigBee. In control station the information is received by ZigBee transceiver and the status of the sensors is monitored in the PC.

Keywords

Fire Alarm system, Raspberry pi, Arduino Uno Embedded C, Embedded Linux.

1. Introduction

Oil and gas refineries show testing situations in which to work can cause wellbeing and security risks to human life. For example, in oil and gas ventures, amid upkeep, assessment, or repair of offices in a refinery, the workers(humans) might be presented to outrageous high temperatures (+50 C) for a broadened timeframe, to lethal gasses including methane, Sulfur Dioxide (SO₂) , Nitrogen Oxides (NO_x),Silica (Silicon Dust/Fracking Sand) and H₂S, and to startling disastrous

disappointments. One method for expelling human introduction from these sorts of circumstances is to instrument an oil refinery with a remote sensor arrange which would append a remote sensor on each gage and valve. Lamentably, this approach will be costly and work serious. Without upkeep remote sensors are disappointment inclined. Thus, upkeep of the system and dependability of the information to be gathered from the system are to a great degree testing. We, in this way, pick an alternate approach that means to enlarge how the human administrators interface with the physical world.

A portable mechanical stage is similar to a physical human, it can travel through a situation independently while detecting its surroundings with a variety of sensors. Assist limitations are connected while bringing physical frameworks into an oil and gas condition. Every one of the gadgets sent must meet the predetermined benchmarks set by the business. A nitty gritty clarification of these norms connected to a portable robot is given in our interdisciplinary venture we intend to computerize oil and gas forms utilizing a versatile robot. A versatile robot fit for both tele-operation and self-ruling control. The robot is equipped for way arranging, following, and maintaining a strategic distance from hindrance and auto investigation. Correspondence amongst robot and the control station happens over Wi-Fi. The robot is furnished with sensors for checking parameters, for example, increment in temperature, spillage of a destructive gas and for distinguishing the level of stickiness. Strategies had been proposed for the plan of a self-governing robot for refineries yet the utilization of Wi-Fi correspondence and limitation was not done. In this paper, we concentrate on utilization of Wi-Fi, while utilizing a versatile automated stage in an oil refinery. In particular, we have considered the two issues: Wi-Fi correspondence and confinement. Initially, while the robot is portable and self-governing, an administrator must have the capacity to speak with it in order to get sensor information gathered from the refinery and in addition send it different summons that control the robot or the arm, ask for particular data, or guides it to move surely. The majority of refineries do not have a remote system foundation. In this manner, the Wi-Fi get to

focuses (APs) must be deliberately set all through a situation to limit the quantity of AP's required to accomplish full scope required for correspondence.

2. Design and Implementation

Existing Design and Methodology

The existing design introduces a low power, practical, and ZigBee convention based remote sensor arrange that gives a shrewd observation and wellbeing framework for underground coal mines. The framework comprises of remote association of a few hubs. Sensor hub fundamentally comprises of ZigBee convention based low power CC2530 handset incorporated with a superior, low power microcontroller on single chip. This incorporated chip associated through RF connector on smartRF05 Battery Board.

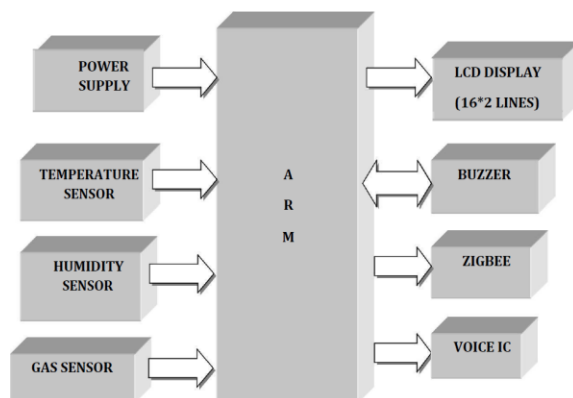


Figure 1: Existing Design Block Diagram

This little size, low power gadget is effectively interfaced with wanted smaller than expected size sensors. Remote sensor hubs join to other sensor hub in particular multi-bounce work organize topology, that makes a ZigBee based remote sensor arrange. This system can be effortlessly put in underground mines and it gives a successfully reconnaissance and security framework for underground coal excavators.

Particularly, it gives the ongoing information correspondence amongst diggers and surface control room through very secure, solid remote sensor hubs. The proposed framework enhances the current excavator's wellbeing and early cautioning reconnaissance in underground coal mines.

Proposed Design and Methodology

Propel remote correspondence and implanted innovation has built up a low power, financially savvy remote sensor hub for secured remote information interchanges. In the wake of beginning the hub, first hub carries on as a facilitator that is in charge of framing a remote sensor organize, which works in light of WIFI norms convention, 2.4GHz license free ISM recurrence band. WIFI alliance are relationship of gathering of organizations which is affirmed and outlines a low power

Radio recurrence handset incorporated with superior microcontroller on single chip module [6].

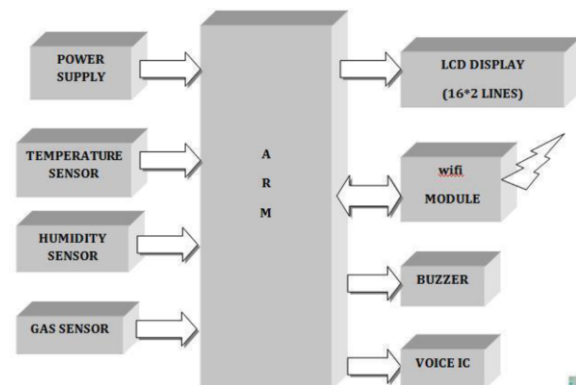


Figure 2: Proposed Design Block Diagram

This module associates with smartRF05 battery board through RF connector that entire unit of equipment is hub. At the point when this hub interfaces with various particular applications sensors, it is fit for detecting information from condition in underground mines, and remote.

The main blocks of this project are:

1. Micro controller (LPC2148)
2. Reset button
3. Crystal oscillator
4. Regulated power supply (RPS)
5. LED indicator.
6. LCD.
7. WIFI
8. APR voice module
9. Temperature sensor
10. Gas sensor
11. Humidity sensor
12. GSM Module

ARM design depends on Enhanced RISC engineering (digresses from great RISC design).

Embedded applications need to have:

- High code thickness
- Low power utilization rate
- Small silicon impression
- A large uniform enlist document (bank).
- Load-Store design, where information processing operations include just registers yet not memory areas.
- Uniform and Fixed length guidelines.

- Good speed/power utilization proportion.
- High code thickness.

This project is implemented using following software's and Linux Operating System:

- Express PCB – for planning circuit
- Keil u Vision3 programming - for gathering part
- Proteus 7 (Embedded C) – for recreation part

In this chapter, schematic diagram and interfacing of ARM microcontroller with each module is considered.

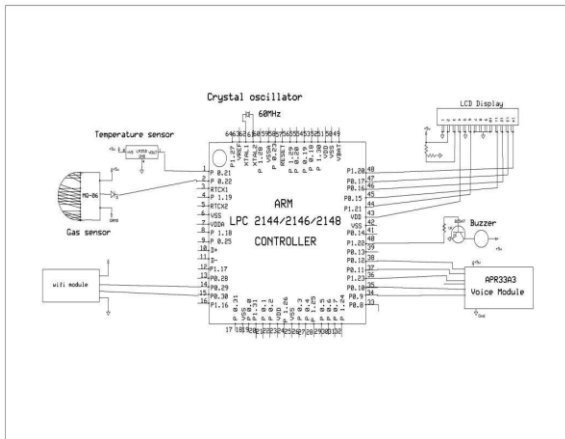


Figure 3: schematic diagram of the Proposed Design

3. Results and Discussion

The Project "Environment Monitoring in Underground Workers safety and communication through Wi-Fi technology" is planned to such an extent that has progressed toward becoming effectively with the assistance of gadgets. By actualizing this paper, the temperature, moistness and gas estimations of the refinery framework are ceaselessly monitored. In case if any of the information is ultra-constrain, it cautions the faculty inside to turn out by methods for a Buzzer. The staff, who stayed inside the mine and can't fall off the mines, will utilize the oxygen head protectors. The related faculty of security will make a move to bring them out securely the task has been executed effectively and coordinated the normal outcomes.



Figure 4: Result of safety system for underground coal mine.

Coordinating elements of all the hardware segments utilized have been created in it. Nearness of each module has been contemplated out and placed deliberately, hence adding to the best working of the unit. Also, utilizing highly propelled IC's with the assistance of developing technology, the project has been effectively actualized. In this manner the project has been effectively composed and tried.

4. Conclusion and Future Scope

Incorporating highlights of all the equipment segments utilized have been produced in it. Nearness of each module has been contemplated out and put painstakingly, in this manner adding to the best working of the unit. Also, utilizing much propelled IC's with the assistance of developing innovation, the venture has been effectively executed. In this manner the task has been effectively composed and tried.

Our Project "Environment Monitoring in Underground Workers safety and communication through Wi-Fi technology," is fundamentally planned to screen and control the encompassing temperature. This venture has a LCD, sensors to associate for programmed detecting activity which are interfaced to the miniaturized scale controller. The Micro Controller is modified such that relying upon the surroundings the framework will play out its activity naturally and the status is shown on LCD. This venture can be additionally stretched out with caution framework.

For a robot to self-sufficiently explore in an Oil and gas refinery, it must have the capacity to speak with the control room and furthermore have the capacity to limit itself. In this work we have characterize the sorts of correspondence required to convey an independent robot. We have contemplated Wi-Fi flag engendering attributes and connected the discoveries to decide WiFi AP arrangement. We have additionally dole out channels to meddling APs. The robot makes utilization of various

sensors to screen the different parameters with the goal that the wellbeing is kept up.

5. References

[1] M. Bai, X. Zhao, Z. Hou, and M. Tan, "A Wireless Sensor Network Utilized as a part of Coal Mines" Proceedings of the IEEE International Meeting on Networking, Sensing and Control, London, UK, pp. 319-323, IS-17 April 2007.

[2] K. Holger, A. Willig, "Conventions and Architecture for Wireless Sensor Systems", John Wiley and Sons, 2008.

[3] R. Conant, "Remote sensor systems: Driving the New Industrial Upset", Industrial Embedded Systems Magazine, Spring 2006.

[4] L. K. Bandyopadhyay, S. K. Chaulya, P. K. Mishra, "Remote Correspondence in Underground Mines: RFID-based Sensor Systems administration", Springer Editions, 2009.

[5] www.en.wikipedia.org/wiki/Leaky_Jeeder
www.ti.com/lit/2S30. "Zigbee Specification report" ZigBee standard association 2007.

[6] T. Maity, P. S. Das, M. Mukherjee, "Safeguard and security framework for underground excavators in view of ZigBee" International Diary of Advanced Computer Engineering and Architecture, Vol. I, pp. 101-06, 2011.

[7] A. Chehri, H. T. Mouftah, P. Fortier, H. Aniss, "Exploratory Testing of IEEE802.15.4 ZigBee Sensor Networks in Confined Region", IEEE Eighth Annual Conference on Communication Networks also, Services Research, Montreal, Quebec, Canada, May, 2010.

[8] T. Mitsugu "Use of ZigBee sensor system to information procurement and checking". Estimation Science Review, Volume 9, No. 6, 2009.

[9] J. Heo, C. S Hong, S. B, Kang, S. S. Jeon, Wireless Home Network Control Mechanism for Standby Power Reduction. In: Proceedings of the International Conference on Wireless Information Networks and Frameworks, pp. 70-75 (July 2007).

[10] Cuomo F., Della Luna, S. Monaco, U., Melodia F., Routing in ZigBee: Benefits from Exploiting the IEEE 802.15.4 Association Tree. In: IEEE International Conference on Communications,

The destinations which were utilized while doing this extend:

1. www.wikipedia.com
2. www.allaboutcircuits.com
3. www.microchip.com

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