

Zigbee based Innovation for Underground Coal Mining Security

K.S.Kamahchi¹, P.Kavitha², Saron E³, Vebathra V⁴, Cynthia Sheba Johnson⁵

Department of Information Technology, New Prince Shri Bhavani College of Engineering and Technology,
Chennai, India^{1,3}

Department of Computer Science and Engineering, New Prince Shri Bhavani College of Engineering and
Technology, Chennai, India^{2,4}
AICL Pvt. Ltd., Chennai, India⁵

ABSTRACT: The propose coal mine wellbeing framework utilizing wireless sensor network replaces customary coal mine security which is wired framework. This checking framework depends on Wireless Sensor Network utilizing ZIGBEE. So there is significant advancement in coal mine wellbeing creation which is protected. Aside from this it is unsatisfactory to lay the links which is exorbitant and consumes additional time. To tackle this issue there is need to plan and foster a Coal Mine Safety System utilizing WSN. In this task there are two segments. The main segment is underground area and second is ground segment. In underground segment the sensor detects the natural boundaries such a temperature, moistness, gas, vibration and so forth. This data is ship off the regulator. The regulator yield is then ship off the ground segment. For the correspondence between underground area and ground segment we utilized WSN which is Zigbee. Ground segment comprises of server comprising of graphical user interface (GUI) which is made by NeatBeans stage utilizing Java programming. Camera likewise appended to the server which checks the encompassing.

KEYWORDS: Wireless Sensor Network, Zigbee, Coal Mining and Security.

I. INTRODUCTION

Over the most recent couple of years for pretty much every nation has one angle that is ecological consideration. In last many years, with next to no control, mishaps in businesses have been expanding. So current circumstance in businesses is more dangerous. As of late, for checking and control of natural boundary in risky climate, present day businesses require instrumentation. Since human wellbeing and property misfortunes are essential to keep up with in modern climate.

In coal mines, at whatever point blasts happen, the salvage work is finished by salvage specialist with no earlier information on the natural condition inside coal mines since mine checking framework might be annihilated or harmed. This makes the existence of salvage laborers extremely dangerous. Coal mine mishaps are unusual, because of number of component this mishaps are happen. Due to this mishaps the human live is at serious risk. Coal mine checking framework is wired framework then the course of action of the framework become intricate. Whenever any sort mishaps happen we get an opportunity of breakages in filaments. We don't have persistently getting the data in such cases. We won't have direct contact to the Ground segment. Inside mines because of awkward circumstance the establishment cost as well as support cost is high for wired correspondence networks.

Number of sensor interfaces with regulators and handling stations straightforwardly. A rising number of sensors speak with one another and share the gathered information wirelessly to an it is unified to handle station which. This is particularly significant on the grounds that many network applications comprise of at least hundreds number of sensor hubs, frequently settled in distant region and blocked off regions. Hence, a wireless sensor has detecting part, on-board handling, correspondence, and capacity abilities. With these upgrades, a sensor hub is liable for information assortment, network examination, connection. Whenever number of sensors on the whole screens actual boundaries, they make a wireless sensor network (WSN). Sensor hubs are speak with one another and sensor

hub speak with a base station utilizing their wireless radios, permitting them to send their sensor information to remote handling, representation, investigation, and capacity frameworks. Figure shows two sensor fields checking two distinct geographic locales and associating with the Internet utilizing their base stations.

The capacities of sensor hubs in a WSN contrast in their correspondence abilities, for instance, utilizing ultrasound, infrared, or radio recurrence advances with shifting information rates and latencies. While basic sensors may just gather and impart data about the noticed climate, all the more remarkable gadgets may likewise perform broad handling and total capacities.

II. LITERATURE REVIEW

In the risky climate, perilous mishap happens. Because of which outcome might be intense and it causes loss of climate, industry and property and life of people. For this different reasons risky natural wellbeing and security is more significant. wireless sensor network in modern site, the organization of circulated point source where the perilous boundaries utilized, created and put away is depicted seven attributes , key viewpoints for assessing and outflow strategy were identified[1]. For estimation of temperature utilizing Virtual Instrumentation is via Automatic Process Control in numerous businesses [2]. This paper shows horticultural climate observing framework for checking data connected with the outside creation of agribusiness climate utilizing WSN innovation [3]. This exploration shows review investigation of need related with long haul stewardship and climate checking [4]. The point of this paper is thought of plan for checking of the identification of risky boundary utilizing framework on chip [5]. In the wireless correspondence during crises is significant for endurance for instance during mishap conventional wired correspondence framework isn't dependable which required wireless radio framework [6] . The field of hardware gives an awesome exhibition and this is acknowledged utilizing zigbee innovation directed by 802.15.4 PAN. WSN replaces existing non standard advancements. The Zigbee works in 868MHz band at an information pace of 20kbps in Europe, 2.4GHz ISM band overall at a 250kbps, 914MHz band at 40Kbps in USA.

III. RESEARCH OPERATION

The proposed framework comprises of two areas as an examined before one is Underground Section and Ground Section. The square chart of Underground segment is displayed above which comprise of Sensor area comprising of Temperature sensor that is Thermistor, Humidity sensor, Gas Sensor, Vibration sensor. What's more, Controller is likewise utilized for controlling reason. It comprises of Device driver and Zigbee transmitter. The Underground segment comprises of Zigbee Receiver, PC, camera appended to PC, and Android Phone. Brief depiction of each square is given underneath.

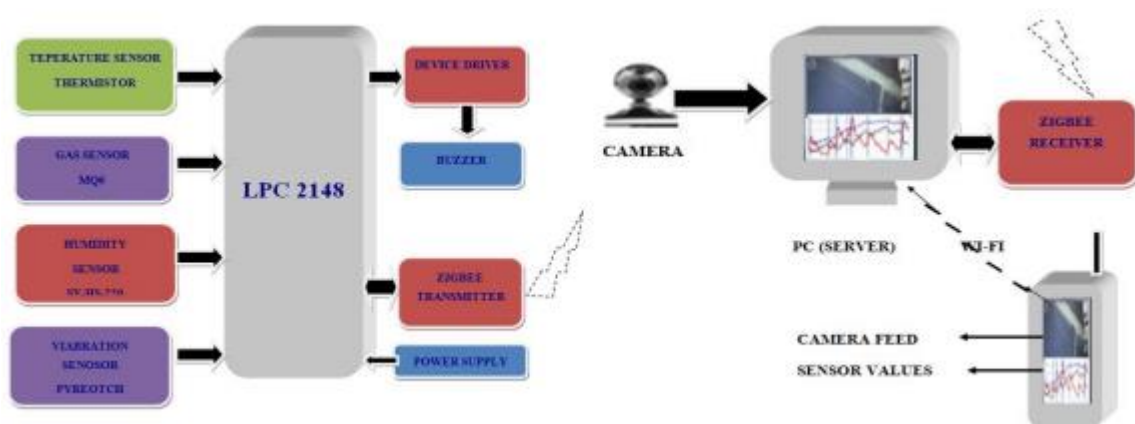


Figure.1 Both Ground and Underground Section

The Underground area incorporates regulator, the quantity of sensors that incorporates stickiness sensor, temperature sensor, vibration sensor and gas sensor. This additionally incorporates the gadget driver, Buzzer and

engine, Zigbee handset. The Ground area incorporates manager PC which goes about as a server, Zigbee handset and there is one GUI which is running on android application.

3.1 Ground Section

In the Ground segment Zigbee handset gets the data and ships off the head. The screen associated with the head shows data in the ground segment. This head is likewise associated with the administrator's android telephone through Wi-Fi network for nonstop checking. Likewise the camera associated with the director persistently filters the encompassing and send it on the administrator android application for safety measure reason. In the Ground Section on the Server PC there is Neat bean stage. Whenever we run a venture Login outline is open so we need to fill secret word when secret phrase matches then we need to go to invite structure in any case we need to drop from it. Then on the welcome edge there is com port determination. At the point when we entered appropriate com port then fundamental structure is open. On this primary structure outline 4 choices are accessible as follows

1. Test Device
2. Test Sensor
3. Test Webcam
4. Control/ Monitor of Administrator

At the point when we pick test Device choice then there is control of on/off the gadget. Whenever we pick the Test Sensor choices then sensor yield is accessible on screen with the advancement bar. At the point when we press Test webcam choice then the camera feed is accessible which checks the encompassing of server. At the point when we press the fourth choice that is control/screen of head then there is all control and it are accessible to screen choices.

At the point when overseer isn't free at the server or it is away from the server then for ceaseless checking, Android application is made which is running on the android telephone. Whenever chairman opens that application then first he ought to enter IP address of PC that is Server's IP address. When this both location matches then second invite outline is open which needs the secret phrase of utilization? So head should enter that secret phrase. Whenever the secret phrase matches then second edge opens. On that there are two choices

1. Check connection
2. Control/ Monitor Devices and Sensor

Check connection checks the whether the Connection is established in the PC and android phone. Control and monitor menu control the output devices that is ON/OFF control and monitor sensor output and also sets the threshold values.

3.2 Underground Section

In the underground segment, the boundaries like temperature, dampness, Gas are measure through particular sensor and the result voltage estimated by them is straightforwardly associated with the ADC of the ARM as the result voltage never surpasses 5V, there is no need of the sign molding circuit. The quantity of individuals inside the coal mine is observed. During the peril this data will be helpful. Data in regards to the wellbeing estimates like wearing oxygen cap and so on will be as of now given to the laborers so they can save their life. In the event that any of the got boundaries are past as far as possible, a Buzzer will be ON, giving advance notice o individuals. The boundaries are sent to the ground area through a zigbee handset.

IV. INCREMENTAL SECURITY MODEL

The proposed work is coal mine wellbeing checking framework in view of Wireless sensor network, and equipment and programming plan of wireless sensor network are depicted exhaustively. This framework can distinguish the grouping of gas, temperature, mugginess and vibration in underground coal mine passages. Wireless sensor networks applied in observing of coal mine security breaks the customary strategy and thoughts, which works on the reasonable capacity and adaptability of checking framework.



V. CONCLUSIONS

This framework might not just screen a wide range of boundaries under coal at any point mine, yet in addition show alert naturally when climate boundaries are strange to surpass the constraint, which help to work fair and square of observing wellbeing framework creation and decrease mishap in coal mine. Accordingly, the coal mine wellbeing framework addresses the issue of coal mine security checking framework. So conventional mine security framework can be successfully supplanted by the observation and wellbeing framework.

REFERENCES

1. S. Wei, L. Li-li, "Multi-parameter Monitoring System for Coal Mine based on Wireless Sensor Network Technology", Proc. international IEEE Conference on Industrial Mechatronics and Automation, pp.225-27, 2009.
2. Chung, P.W.H. and Yang, S.H. (2003) 'Safety analysis of process plant control systems based on model checking', The Journal of Safety & Reliability, Vol. 23, pp.19 –34, 2013
3. S.C.S. Jucá, P.C.M. Carvalho and F.T. Brito, "A low cost concept for data acquisition systems applied to decentralized renewable energy plants", Sensors, 2011, vol.11, pp. 743-756 , 2011
4. Chung, P.W.H., Yang, S.H. and Edwards, D.W. (1999) 'Hazard identification in batch and continuous computer-controlled plants', Industrial & Eng. Chem. Research, Vol. 38, pp.4359 – 4371, 2013
5. X. Ma, Y. Miao, Z. Zhao, H. Zhang, J. Zhang, "A novel approach to Coal and Gas Outburst Prediction Based on Multi-sensor Information Fusion", Proc. IEEE international conference on automation and logistics, pp 1613 - 18 , 2008 .
6. Y.P Zhang, G.X Zheng, J.H. Sheng "Radio Propagation at 900 Mhz in underground coal mine ", IEEE transactions on antennas and propagation, vol. 49(5), pp. 752-62, 2001
7. Andrew Sloss, Dominic Symes, Chris Wright, ARM system Developer's Guide, 2004, Morgan Kaufmann, ISBN: 1-55860-874-5
8. MDK-ARM, Keil™ Tools By ARM, Keil0223-3\01.11J.S.
9. Zigbee Specification Document 053474r17, January 17, 2008, Zigbee Alliance.
10. Steve Furber, ARM System-on-chip Architecture, second Edition, 2000, Addison Wesley, ISBN 0-201-67519-6.