ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 19, April 2017

Design And Implementation Of Coal Mine Safety System Using IoT

S.Mohamed Ajmal[1], R.Jebarson Immanuel[2], P.Karguvel Pooraja[3], C.V.Uma Maheswari[4]
Dept of Electronics and Communication Engineering, Kings Engineering College, Sriperumbudur, India
[1]mohamedajmal6044@gmail.com, [2] jeferson17595@gmail.com,[3] karguvelc112@gmail.com,
[4]umamaheswarisivagami@gmail.com

***Abstract*—Now a day's due to global warming and climate changes there are challenging situation in field of coal mine. To reduce the cost and improve the productivity along with product quality the atomization in the field of coal mine is indeed necessary, which will also reduce the mine workers efforts. This paper proposes a design of a Wireless Sensor Network (WSN) with the help of Raspberry pi controller which is able to monitor the temperature, humidity, gas and status of smoke in an under ground mine. This system also controls the ventilation demand to mine workers depending upon present climate conditions within the mine field. This system utilizes the low power, cost effective Raspberry pi a temperature sensor LM35,humidity sensor SYSH220,smoke detector, gas sensor for sensing the mine climate parameters and Wi-Fi for remote logging of data at central location to control the climate state with the help of motor and value control circuitry.**

***Keywords*—Raspberry pi, Gas Sensor, Humidity Sensor, LDR, Temperature Sensor, IoT.**

I. INTRODUCTION

Traditional coal mine monitoring systems tend to be wired network systems, which play an important role in coal mine safe production. This system controls the ventilation demand to mine workers depending upon present climate conditions within the mine field. Here we proposes a design of a Wireless Sensor Network (WSN) with the help of Raspberry pi controller which is able to monitor and control the under ground mine climate condition. With continuous enlarging of exploiting areas and extension of depth in coal mine, many laneways become blind areas, where in there are lots of hidden dangers. Moreover, it is inconvenient to lay cables which are expensive and consume time. In order to solve the problems, we will design a coal mine safety monitoring system based on wireless sensor network, which can improve the level of monitoring production safety and reduce accident in the coal mines Wireless sensor networks is composed of a large number of micro-sensor nodes which have small volume and low cost.

II. LITERATURE REVIEW

Previously there are many of the projects which are related to coal mine safety system. Following are the previous projects.

A. The innavation mechanism research of coal mine safety production supervision

The current coal mine security situation grim, malignant accidents occur frequency, the main reason is the serious illegal or irregular act, the manage problem of false lax in some places is relatively outstanding. The coal; mine enterprises to form effective restriction mechanism, can make up for government macroscopic supervision and limitation of their own management and shortage.

B. Advance of fiber optic gas sensors for coal mine safety applications

Coal mine combustion is major safety hazard which is conventionally detected by monitoring characteristic gases such as CO, C_2H_4 and C_2H_2.Fiber optic multi gas sensors have been developed which provide advantage of real time in detection, low cross sensitivity and low cost for coal mine combustion detection.

C. Light Weight Mashup Middleware for Coal Mine Safety Monitoring and Control Automation

Recently the frequent coal mine safety accidents have caused serious casualties and huge economic losses.it is urgent for the global mining industry to increase operational efficiency and improve overall mining safety. This paper proposes a lightweight mash up middleware to achieve remote monitoring and control automation of underground physical sensor devices. First the cluster tree based on ZigBee Wireless Sensor Network (WSN) is a deployed in underground coal mine and propose an Open Service Gateway Initiative (OSGI) based uniform message space and data distribution mode land also a lightweight services mash up approach is implemented.

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 19, April 2017

III. COAL MINE SAFETY USING RASPBERRY PI

By using the Raspberry pi we can access the coal mine through the internet by the concept of IoT (Internet of Things) and this Raspberry pi also the very efficient when compared to other technology. Through which we can connecting the sensors in the GPIO pin layout .It is also a mini CPU where we can interface with audio and video. So under the mine it will be monitor through the system. It can also be useful transmit the data where we want. We can also extend the memory by giving the external memory as SD card .

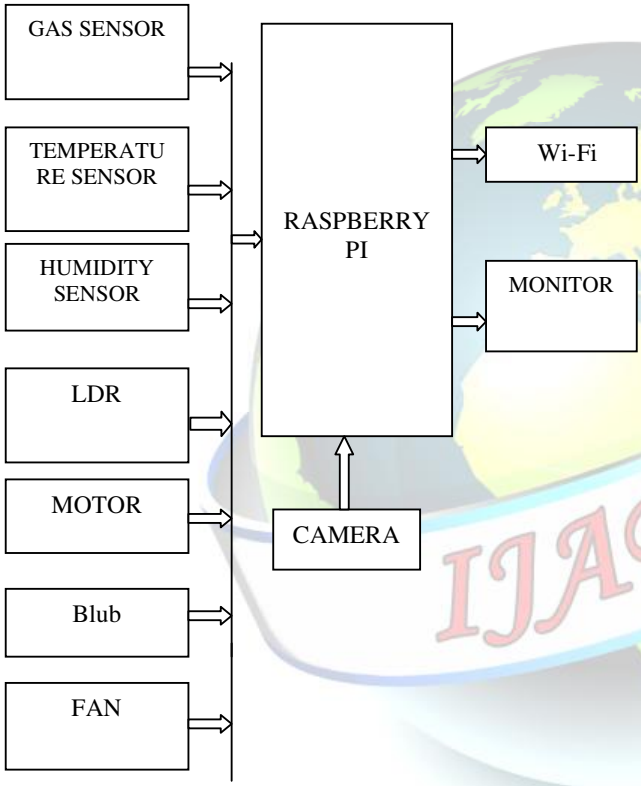

Fig.1. Coal mine safety system

This is the main block diagram used in the propose system. While using the four sensors that can be detected and given to raspberry pi, while motor, fan, blub are be used control under the mine which will be connected wired to raspberry pi and camera is connected to capture the image of detected sensor. The raspberry pi will be monitor through the system. The four sensor as the input to the raspberry pi.

A) Raspberry Pi

The Raspberry is a computer it uses a different kind of processor. The Raspberry pi is used to surf the internet, send an email or write a letter using a word processor. If it was connect the Pi directly to a PC or laptop, it won't be able to connect out onto the Internet by default. To do so, should be need to configure the PC to bridge the wired Ethernet port and another (typically wireless) connection.

But if it was completely unable to connect the Pi to the Internet in any other way, that can try searching your operating systems helps file for "bridge network" to find more guidance.

With a cable connected, the Pi will automatically receive the details it needs to access the Internet when it loads its operating system through the Dynamic Host Configuration Protocol (DHCP). This assigns the Pi an Internet Protocol (IP) address on the network, and tells it the gateway it needs to use to access the Internet (typically the IP address of your router or modem).For some networks, there is no DHCP server to provide the Pi with an IP address.

Fig.2. Raspberry Pi 3 model

B) Gas sensor

The intent of this reference guide is to describe in detail the Gas Sensor Platform with *Bluetooth*® Low-Energy Reference Design from Texas Instruments. After reading this reference design, a user should better understand the features and usage of this reference design platform. The Gas Sensor Platform with *Bluetooth* Low-Energy (BLE) is intended as a reference design that customers can use to develop end-products for consumer and industrial applications to monitor gases like Carbon Monoxide (CO), oxygen (O_2), ammonia, fluorine, chlorine dioxide and others.

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 19, April 2017

Fig.3. Gas Sensor

C) Temperature sensor

The LM-35 series are precision integrated-circuit temperature devices with an output voltage linearly proportional to the Centigrade temperature. The LM35 device has an advantage over linear temperature sensors calibrated in Kelvin, as the user is not required to subtract a large constant voltage from the output to obtain convenient Centigrade scaling. The LM35 device does not require any external calibration or trimming to provide typical accuracies of ±¼°C at room temperature and ±¾°C over a full −55°C to 150°C temperature range.

Lower cost is assured by trimming and calibration at the wafer level. The low-output impedance, linear output, and precise inherent calibration of the LM35 device makes interfacing to readout or control circuitry especially easy. The device is used with single power supplies, or with plus and minus supplies. As the LM35 device draws only 60 µA from the supply, it has very low self-heating of less than 0.1°C in still air.

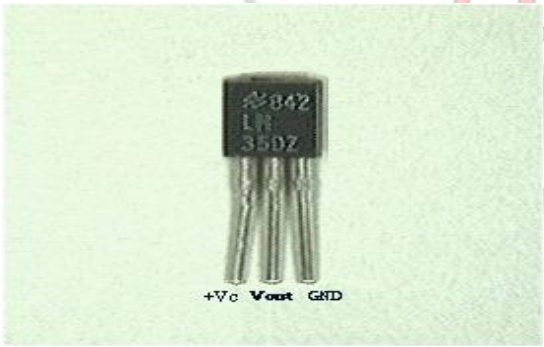

Fig.4. Temperature Sensor (LM-35)

D) Resistive Humidity sensor

The transduction mechanism of resistive humidity sensors involves the changes in conductivity caused by the adsorption of water vapor typically; sensors of this type utilize three major categories of materials: (1) ceramics, (2) polymers and (3) electrolytes. The basic configuration of these sensors resembles that of capacitive humidity sensors other than that the dielectric layers are replaced by conductivity-sensitive layers.

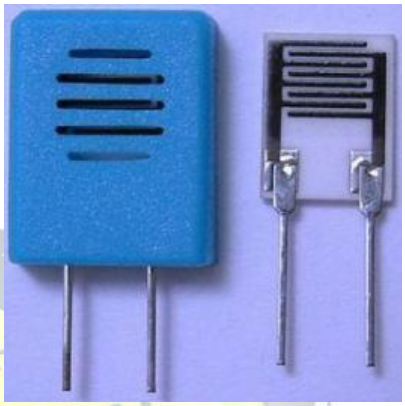

Fig.5. Humidity Sensor

E) LDR

The on-chip ambient sensor has the power to measure the exact visible light from 0.03 lux to 65,000 lux and communicate through an I2C digital communication bus. The IC has patented sensors, filters, and circuitry to mimic the human eye response.With on-chip calibration registers, it performs the same in different light conditions (i.e., fluorescent, incandescent).The interrupt pin minimizes the need of constant polling of the device,freeing up microcontroller resources for efficient communication and thus reducing overall power consumption.

F) Webcam

In this system we use a USB 2.0 Webcam of 25MP (interpolated). It provides a frame rate of up to 30 fps.

Fig.6. Web Cemera

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 19, April 2017

IV Software

A) Python

There are considerable numbers of programming languages which have been adapted for Raspberry Pi. Python programming language is recommended by The Raspberry Pi foundation especially for the beginners. Basically any programming language which can be compiled for ARMv6 can run on the Raspberry Pi. There-fore the users are not restricted to use only the Python. On the Raspberry Pi there are preinstalled several languages for example C, C++, Java, Scratch and Ruby.

Python is a flexible and powerful programming language but still it is easy to learn and follow. The clear syntax of Python makes it a valuable tool for users who wants to learn programming. This is one of the reasons why it is recommended by the Raspberry Pi Foundation. Python is published under an open-source license and it is available for different operating systems. Python runs on Linux, OS X and Windows computer systems.

Cross-platform support guarantees that the programs which are written in Python are also compatible in other platforms.

B) Raspbian Jessie OS

Raspbian is a Debi an based computer operate in system for Raspberry Pi. It is now officially provided by the Raspberry Pi Foundation, as the primary operating system for the family of Raspberry Pi single-board computers. Raspbian was created by Mike Thompson and Peter Green as an independent project. The initial build was completed in June 2012.The operating system is still under active development. Raspbian is highly optimized for the Raspberry Pi line's low-performance ARM CPUs.Raspbian uses IXEL, **P**i **I**mproved **X** windows **E**nvironment, **L**ightweight as its main desktop environment as of the latest update. It is composed of a modified LXDE desktop environment and the Open box stacking window manager with a new theme and few other changes.

The distribution is shipped with a free copy of computer algebra program Mathematical. It also includes a version of Mine craft called Mine craft Pi and includes a Pi-enhanced version of Chromium as of the latest version. Raspbian is an unofficial port of Debi an Wheezy armful with compilation settings adjusted to produce optimized "hard float" code that will run on the Raspberry Pi. This provides significantly faster performance for applications that make heavy use of floating point arithmetic operations. All other applications will also gain some performance through the use of advanced instructions of the ARMv6 CPU in Raspberry Pi.

Although Raspbian is primarily the efforts of Mike Thompson and Peter Green (plug wash), it has also benefited greatly from the enthusiastic support of Raspberry Pi community members who wish to get the maximum performance from their device.

V Working Process

These four sensors are be connected to the raspberry pi when their will be change in the mine of any gases are temperature. The sensor will be detected then camera will capture the photo the massage will be send it our phone by the IoT process used in the raspberry pi. The sensor detecting also be monitor. Photo which are capture will be sent it our email address for our requirements. This coal mine will be also control through the mobile to change the temperature and also to reduce the unwanted gas in the mine by the concept of IoT in raspberry pi system.

VI Result

In this paper, We reviewed the current state and projected future directions for robotics and industries by applying sensors, particularly those equipped with IoT intelligence, offer attractive options for enabling observation and recording of data in industries and work environments the safety regulators should introduce the Relevant Policies Rules and Regulations and Standards and trained professionals, as a set of scientific management system

VII Future scope

The system can also be used for various other applications such as for security in Robotics and industries etc., the system can provide a more efficient, compact and also it will be control by the workers through out mobile.

References

[1] Cal Lili, Wei Pingjun, GAO hui. A study recovery mechanism using Secondary path in ad-hoc network for coal mine[j]. Communication Technology, 2008, 41(4):149-151.
[2] Toby Berger. Spatial channel reuse in wireless sensor network[j]. Wireless Network, 2008,14(2):133-146.
[3] YANG Wei, FENG Xisheng, CHENG Shixin, et al. The theories and Key technologies for the new generator mine wireless information System[j]. journal of china coal society, 2004,29(4):506-509.
[4] H. Aniss, P.-M.Tardif, et al. Communications network for underground mines based on the IEEE802.1 I and DOCSIS standards[C]. 2004, 5(26):3605-3609.
[5] Liubin Li, Guoyi Li, Du Peng, et al. Embedded design of precise Positioning system based in ZigBee and ARM[J]. Electronic Engineer, 2012, 5(1):82-84.

ISSN 2394-3777 (Print)
ISSN 2394-3785 (Online)
Available online at www.ijartet.com

International Journal of Advanced Research Trends in Engineering and Technology (IJARTET)
Vol. 4, Special Issue 19, April 2017

[6] Wanbo Zheng, Yanqing Wu, Chengliang Xie, et al. Research on the key technology of a new mine emergency rescue command and Communication system[j].coal socience and technology. 2009, 37(8): 100-103.
[7] N Siemons, A Busch. Measurement and interpretation of Supercritical C02 Sorption on Various Coals[J]. International journal of Coal Geology. 2007, 6(4):229-242.