Real Time Gas Leakage Detection using Cloud

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Abstract— **The majority of the people in the India use Liquefied Petroleum Gas (LPG) as a fuel for cooking, but in India the technology applied in the field (security) is very less. LPG is a flammable gas, which has the potential to create a risk, therefore it is important that the properties and safe handling of LPG are understand and applied in the domestic/industrial situations. The gas leakage detection system can constantly monitor the gas leak with the help of the sensors. ZigBee is used to feed real time sensor data over the cloud. The sensor monitors, detects and raises an alarm whenever a gas leak or fire broke out condition is detected. This data is made available at real time feeds over the cloud. Thus making it possible to collect, store and analyze the large amount of data in several new forms and activate context based alarm. This novel information acquisition paradigm allows continuous and ubiquitous leakage information access from any connected device over the internet. This data helps in easily locating the root cause of the emergency condition. So, one can know the complete detail of the hazards.**

Keywords—LPG; sensor; ZigBee; data; cloud;

I. INTRODUCTION

Leakage detection and location is one of the paramount concerns of home owner all over the world. A timely evaluation and response to a gas leakage, allows proper management of the serious condition and an effective risk minimization With the continuing growth of the forces of social production and the gradual awakening of the people's consciousness of the importance of home safety, a series of measures have been put forth to ensure person's safety. In home, small negligence may cause heavy economic losses and environmental pollution. Therefore, many companies, including Petro China and Sinopec, are provide large amounts of funds to upgrade existing systems in order to remove the hidden danger condition. However, there are still some limitations on real-time monitoring, data transmission and to find accurate location of a leakage point when an accident happens. Mainly because: most of the current equipment's are based on wired networks, it is undeveloped in technology and hard to be deployed; the technology of data acquisition in gas leakage condition is also unsophisticated and because of this it is hard to locate the leakage point.

These issues can be solved with the help of Wireless Sensor Networks (WSN).

II. REQUIREMENT ANALYSIS

Mainly assembly language programs are designed specially for processor because of that this programming language did not offer portability feature across system. To overcome this drawback several high level languages are designed like C, JAVA. Some other languages like PLM, Modula-2, and Pascal are also came but couldn't accept for embedded system. . Amongst those, C got wide acceptance for not only embedded systems, but also for desktop applications. Nowadays even though C is not use as mainstream language for developing general purpose applications, still it has strong-hold in embedded application development. Due to the wide acceptance of C for developing the embedded systems, various kinds of support tools like compilers & cross-compilers, ICE, etc. came up and all this facilitated features are use for development of embedded systems using C.

A. Gas Sensor

The electrical properties of the sensor would change with variations in gas concentration. Sensitive material of MQ-6 gas sensor is SnO_2, which with lower conductivity in clean air compared to MQ-3 and MQ-7. When the target combustible gas exist, the sensor's conductivity is higher along with the gas concentration rising. MQ-6 gas sensor[8] has high sensitivity to Propane, Butane and LPG, also response to Natural gas while other sensors are less sensitive to LPG.

B. ZigBee

ZigBee [2] is new wireless technology guided by IEEE 802.15.4 Personal Area Network standard. It is primarily designed for the wide range controlling applications and to replace the existing non-standard technologies while GSM has free bandwidth, there is less ease of data transmission. One of the main advantages of this ZIGBEE communication is that it provides a noise free communication than GSM, the amount of noise added in this type of communication is very less compared to the other wireless communications.

Special Issue - 2017

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
ICIATE - 2017 Conference Proceedings

C.   Arduino

8051 is just a single microcontroller while Arduino [3] is a development board which comes with various series of microcontrollers, mostly AVR'S. 8051 is a CISC microcontroller which has limited features, even on board ADC and DAC is not available for development of simple program, it also takes a lot of efforts. Arduino have ATMEGA328 microcontroller with RISC architecture and the board supports various features. In case of the code over Arduino superset the 8051 as there is no need of separate programmer instead of that the USB port will directly connect your PC with board and reduce time to create and burn HEX file.

D.   Cloud Analysis

On cloud, analyze and store the data and communicate wirelessly for further analysis is possible. Anyone can access the leakage data from anywhere using any Internet enabled device like PC, tablet or smart phone, and analyze it.

III. BLOCK DIAGRAM

To resolve the problems of existing work the new approach is extension work for GSM based gas leakage detection [4]. The propose work will solve the problems of sensor failure, less ease of data transmission. This work will majorly process gas leakage detection system using following parameters; they are gas sensor, microcontroller, buzzer, motor, ZigBee (transmitter and receiver), power supply and cloud computing.

1) Gas sensor detects the gas leakage and gives the signal to the microcontroller.

2) Microcontroller receives the signal, send by gas sensor. It sends activation signal to motor, buzzer, LCD (Liquid Crystal Display), ZigBee.

3) Buzzer [8] gives sound indication.

4) Motor turns off the regulator of gas cylinder and performs protective action.

5) ZigBee transmitter always searches for the gas leakage. When the gas at transmitter is detected, it sends the information to the microcontroller.

6) ZigBee sends details of this node to the receiver, the receiver will send to the Laptop/Computer [8] to update the details.

7) This information will be fed on cloud through laptop/computer.

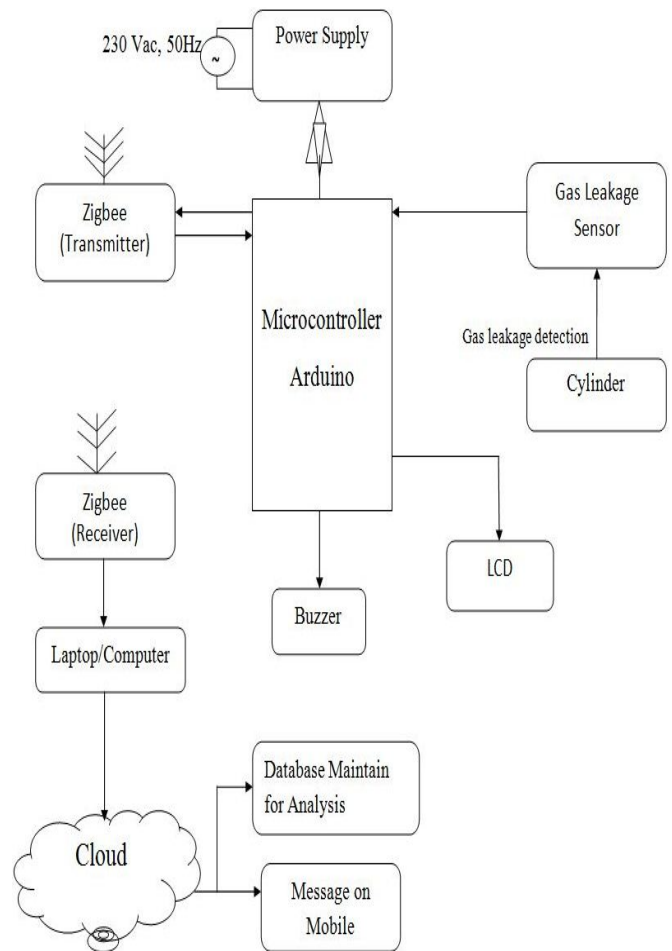8) On cloud [7] data is collected, stored and analyzed in a form and context based alarm will generate.

Fig. 1 Block Diagram

IV. FLOW DIAGRAM

The figure represents data flow diagram for gas leakage detection module and analysis of data on cloud.

In this level 0 of data flow diagram, the sensor detects the leaked gas in appropriate manner. The sensor sends and signals to the microcontroller. The activation signal is received by ZigBee, buzzer, motor and output devices, depending on that signal the motor turn off the regulator of gas.

In this level 1 of data flow diagram, the gas leakage detection module sends the details of leakage to the microcontroller and it generate the activation signal. The ZigBee transceiver updates the all details on laptop/computer. The cloud generates the context based alarms to the owner. The cloud creates a database for analyzing the data of leakage.

Special Issue - 2017

International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
ICIATE - 2017 Conference Proceedings

V. CONCLUSION

This software approach can develop a real-time detecting and controlling of gas leakage system highly sensitive industries using ZigBee, Arduino microcontroller. It comprises ZigBee modules, gas sensor, so it can be easily deployed. In two modes this system can be operated they are: fixed more and dynamic deployment mode such as when any accident occurs. So with this proposed method can overcome the shortcomings of the current systems. With this the rescue management improves and can save economy and lives very quickly.

VI. FUTURE SCOPE

Wi-Fi module can be used for large scale areas like industries to monitor leak of gas in each room from the control room. This paper mainly aims to implement gas leakage detection technology with cloud. We can use temperature sensor, Multi Language Display, audio o/p to make it user friendly. However, this application can also be developed in future by integrating more number of equipments to measure various parameters, for instance, a humidity sensor or an optical sensor to determine the humidity.
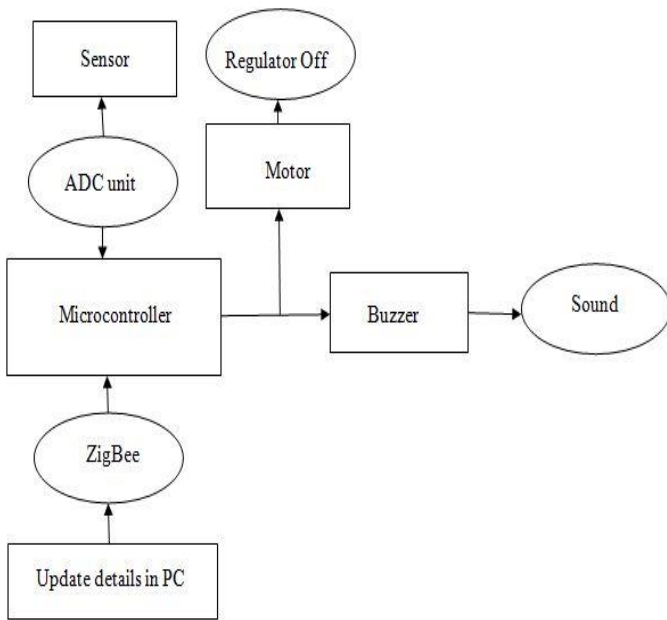
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Fig. 2 DFD level 0

Fig. 3 DFD level 1

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[8] P.Ram Bhupal, M.Soujanya "Real-Time Monitoring and Preventive Measures of Leakage Accidents in Gas and Petrochemical Industries using ZigBee" International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 www.ijera.com Vol. 2, Issue 6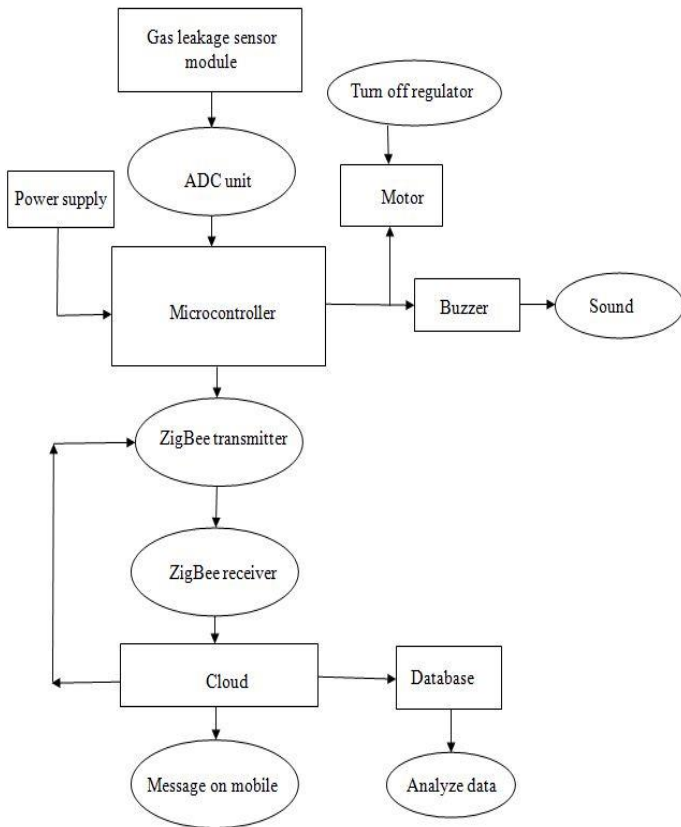, November- December 2012, pp.830-834.