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IoT based Supervision of Smart Gas Distribution Network

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ABSTRACT

Liquid Petroleum Gas is used on a large scale for domestic and industrial purposes. Main constituents of LPG are propane and butane. The proportion of these gases varies according to applications. These gases are highly flammable and if not used carefully they can be dangerous and lethal. LPG is an odourlessgas, hence leakage detection of this gas cannot be detected via smell. Leakage detection and location is one of the major concerns of homeowner all over the world. Proper management of the consequences and an effective risk minimization can be done by timely evaluation and proper response to leakage. The traditional gas leakage detectors are not more concern about the safety of people. The proposed system uses IOT and gives us a way to detect gas leakage as well as take proper measures for providing safety to users. Over the past decade, Internet of Things is expanding and is being used in various applications such as home automation, smart city, smart farming, etc. IOT is a network of physical devices embedded with different types of sensors and actuators and via internet connectivity is able to exchange and collect data. It goes beyond machine to machine communications to make use of variety of protocols, applications and domains. It helps in making applications which are cost efficient.

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I. INTRODUCTION

Liquid Petroleum Gas is used on a large scale for domestic and industrial purposes. Main constituents of LPG are propane and butane. The proportion of these gases varies according to applications. These gases are highly flammable and if not used carefully they can be dangerous and lethal. LPG is an odourlessgas, hence leakage detection of this gas cannot be detected via smell. Leakage detection and location is one of the major concerns of homeowner all over the world. Proper management of the consequences and an effective risk minimization can be done by timely evaluation and proper response to leakage. The traditional gas leakage detectors are not more concern about the safety of people. The proposed system uses IOT and gives us a way to detect gas leakage as well as take proper measures for providing safety to users. Over the past decade, Internet of Things is expanding and is being used in various applications such as home automation, smart city, smart farming, etc. IOT is a network of physical devices embedded with different types of sensors and actuators and via internet connectivity is able to exchange and collect data. It goes beyond machine to machine communications to make use of variety of protocols, applications and domains. It helps in making applications which are cost efficient.

II. LITERATURE SURVEY

Background:
To work against the dangerous effects of gas leakage, significant efforts was carried out in manipulative and miniaturizing the gas leak sighting technique. The occurrences of gas leak-related incidents are studied by several researchers and have published statistical data incidents.

In 2012, Somov et al reported “Energy-Aware Gas Sensing Using Wireless Sensor Networks” focusing on a sensor node, a relay node, a wireless actuator and a network coordinator. The network coordinator is the main unit of the

WSN. It supports the network operation by wireless communication based on the IEEE 802.15.4 standard and the ZigBee specifications. The network coordinator is also responsible for alerting a network operator or an emergency service using the Ethernet network or sending a SMS using a GSM/GPRS modem. In fact, upon receiving the alert message from the sensor node, the network coordinator can perform the first counter action by deactivating the source of gas emission via the wireless actuator.

In 2011, Bhattacharjee designed a system entitled "Design and Development of a Flexible Reliable Smart Gas Detection System". The system composed of three modules; the base station, wireless sensor array and an intelligent wireless alarm unit, which offers high reliability, flexibility and uninterrupted sensing. These are achieved by incorporating various intelligent protocols like auto sensor calibration, sensor handover, wireless threshold fixation and intelligent alarm mechanism. The sensor node consists of three gas sensors, one temperature sensor and one pyro-electric infrared sensor (PIR) which enhances the sensing intelligence. The sensed data are digitized and processed by the peripheral interface controller (PIC) 16f877A based centralized embedded platform and wireless communication is achieved with a pair of 433 and 315 MHz amplitude shift keying (ASK) wireless module. The encoding and decoding of sensed data offer a high secured gas detection system.

A "GSM Based Gas leakage Detection System" by Srivastava and Prabhukar provides a cost effective and highly accurate system, which not only detects the gas leakage but also alert and turn off the mains power and gas supplies and sends a SMS. Rammaya and Palaniappen reported an "Embedded System for Hazardous Gas Detection and Alerting".

Sr.No.	Paper	Author	Year	Description
1	Risk index assessment for urban natural gas pipeline leakage based on artificial neural network. (IEEE paper)	Yang Zhou, Zhengwei Wu.	2017	This paper proposed an assessment program to evaluate risk of urban natural gas pipeline leakage Artificial neural network includes inputs such as methane concentration, weather, corrosion, to simulate risk index of gas pipeline.
2	IOT based gas leakage detection system using database logging, prediction and smart alerting. (IOSR Journal of Engineering)	Vidya Gandhi, NehaKunte, vinayshriNai, ChaitaliBage.	2018	This project involves database logging and prediction having alerting techniques involving text message and an e-mail to the concerned authority whenever there are any chances of gas leakage.
3	IOT based smart gas monitoring system. (IOSR Journal of Electrical and Electronics Engineering)	Deepesh Nair, Rakesh K, Sampath K, Gayathri S Nair.	2017	The main aim is to propose the design and construction of an SMS based gas leakage alerting system. With the help of infrared sensor the issue of gas wastage is also monitored. An alarm goes off whenever the sensor doesn't detect any vessel over the burner beyond a particular time period.
4	IOT based gas leakage monitering and alerting system with MQ-2 sensor. (IJEDR Journal)	Rohan Chandra Pandey, Manish Verma, Lumesh Kumar Sahu.	2017	The main objective of this project is designing microcontroller based toxic gas detecting and alerting system. In this system, if toxic gases exceeds normal level then an alarm is generated and message is sent to aythorized person.
5	Cloud connected smart gas cylinder platform senses LPG gas leakage using IoT application. (IJMSR)	Dr. S.Ravichandran	2017	This paper explains about the most common problem experienced in our day-to-day lives that is regarding gas container getting empty. This system is connected to cloud so that it will give the output on mobile by fetching the data from cloud.

III. BLOCK DIAGRAM AND DESCRIPTION

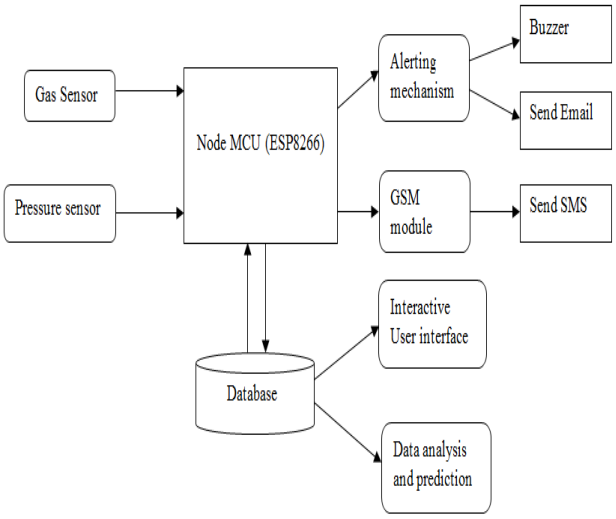

Fig 1. Block diagram

NodeMCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the development kits. The firmware uses the Lua scripting language. It is based on the eLua project, and built on the Espressif Non-OS SDK for ESP8266.A gas sensor is a device that detects the presence of gases in an area, often as part of a safety system. This type of equipment is used to detect a gas leak or other emissions and can interface with a control system so a process can be automatically shut down. A gas sensor can sound an alarm to operators in the area where the leak is occurring, giving them the opportunity to leave. This type of device is important because there are many gases that can be harmful to organic life, such as humans or animals.

A pressure sensor is a device for pressure measurement of gases or liquids. Pressure is an expression of the force required to stop a fluid from expanding, and is usually stated in terms of force per unit area. A pressure sensor usually acts as a transducer; it generates a signal as a function of the pressure imposed. For the purposes of this article, such a signal is electrical.A database management system is a software application that interacts with end users, other applications, and the database itself to capture and analyze data. A general purpose DBMS allows the definition, creation, querying, update, and administration of database. In this, the data from Node MCU is delivered to the database server via internet. The data from database is analyzed and predictions can be made by the end users.

GSM/GPRS module is used to establish communication between computer and GSM-GORS system. Global System for Mobile communication(GSM) is an architecture used for mobile communication in most of the countries. Global Packet Radio Service(GPRS) is an extension of GSM that enables higher data transmission rate.A buzzer or beeper is an audio signalling device, which may be mechanical, electromechanical, or piezoelectric. Typical uses of buzzers and beepers include alarm devices, timers, and confirmation of user input such as a mouse click or keystroke.

IV. RESULT

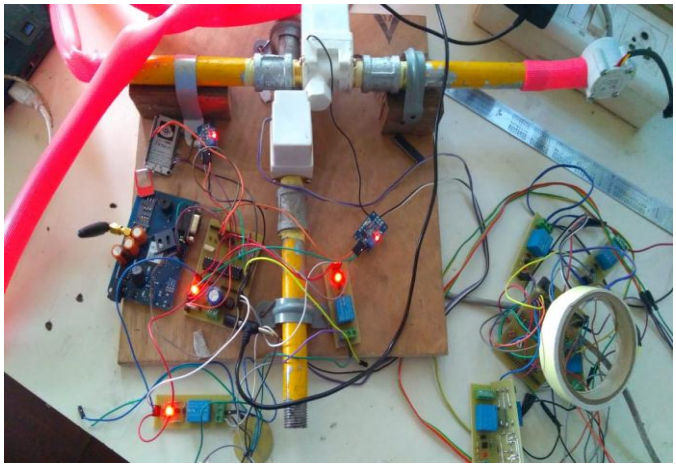

Fig 2. Hardware setup

V. CONCLUSION

- A review of existing designs of gas leakage detector with emphasis on the wireless type has been done.
- In case there is a gas leakage in a hose, hotel, this security system will simultaneously complete two tasks. Firstly it will turn off power supply, secondly it will send the message to the predefined end user.
- Due to this simultaneous action accidents can be prevented.

REFERENCES

1) R. Buyya and A. V. Dastjerdi, Internet of Things: Principles and Paradigms. San Mateo, CA, USA: Morgan Kaufmann, 2016.
2) P. Varga et al., “Making system of systems interoperable the core components

of the arrowhead framework,” J. Netw. Comput. Appl., vol. 81, pp. 85–95, Mar. 2017
3) J. Robert et al., “O-MI/O-DF standards as interoperability enablers for industrial internet: A performance analysis,” in Proc. 42nd Annu. Conf. IEEE Ind. Electron. Soc., Oct. 2016, pp. 4908–4915.
4) J. Tsado, O. Imoru, S.O. Olayemi , —”Design and construction of a GSM based gas leak Alert system”‖, IEEE Transaction,. IRJEEE Vol. 1(1), pp. 002-006, September, 2014
5) NiheshRathod, Pratik Jain and RenuSubramanian,”Performance Analysis of Wireless Devices for a Campus-wide IoT Network”. The 2015 International Workshop on Wireless Network Measurements and Experimentation, 2015
6) QaziMamoon Ashraf, Mohamed HadiHabaebi, GopinathRaoSinniah, MusseMohamud Ahmed,

Sheroz Khan," Autonomic Protocol and Architecture for Devices in Internet of Things ", 2014 IEEE innovative smart grid technologies ,Asia(ISGST ,Asia)

7) NiheshRathod, Pratik Jain and RenuSubramanian,"Performance Analysis of Wireless Devices for a Campus-wide IoT Network". The 2015
8) K. S. Narendra and K. Parthasarathy, "Identification and control of dynamical systems using neural networks," IEEE Transactions on Neural Networks, vol. 1, no. 1, pp. 4–27, Mar. 1990.
9) Hu, L. Zhang, and W. Liang, "Detection of small leakage from long transportation pipeline with complex noise," Journal of Loss Prevention in the Process Industries, vol. 24, no. 4, pp. 449–457, Jul. 2011.

