A REVIEW ON IOT BASED HAZARDOUS GAS LEAKAGE DETECTION & CONTROLLING SYSTEM USING MICROCONTROLLER & GSM MODULE

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ABSTRACT

The project is geared toward developing the protection of Home against Intruders, Gas Leak and hearth. In any of the on top of 3 cases anyone met whereas you're out of your home than the device sends SMS to the emergency no provided thereto. The report consists of a background into the realm of 8051 microcontroller and mobile communication, however they're interfaced to every different and AT commands set utilized in communication. Gas sensors area unit used during a big selection of applications within the fields of safety, health, instrumentation etc. Common examples area unit domestic/commercial alarms for explosive or deadly gases, or in automotive application as gas run detectors for LPG powered cars and exhausts detectors within any fuel powered truck/car. Such sensors, nowadays, area unit found conjointly in applications involving air internal control systems and pollution observance. Today's sensors, whereas that includes a high sensitivity to a good gases selection, area unit terribly compact in size and have considerably reduced their power consumption to raised adapt to transportable solutions. Building a system with a gas sensing element isn't as straightforward because it may seem. Despite the sensing element can be treated, basically, as a resistance (which worth depends on gas concentration during air) the sensible implementation in a project ought to be done considering some style rules, particularly if the ultimate circuit may be a device to be utilized in a field wherever responsibility is powerful.

KEYWORDS: GSM, microcontroller, MODEM, SIM, LCD, mobile communication, leakage sensor, 555 timers

INTRODUCTION

A gas detector may be a device that detects the presence of gases in a part, usually as a part of a security system. Therefore this kind of kit is employed to find a gas leak or alternative emissions and might interface with a sway system so a method are often mechanically pack up. A gas detector will sound an alarm to operators within the space wherever the leak is going on, giving them the chance to depart. This kind of device is very important as a result of their area unit several gases that may be

harmful to organic life, like humans or animals. Gas finders are often accustomed detect flamable, ignitable and hepatotoxic gases, and chemical element depletion. This kind of device is employed wide in business and might be found in locations, like on oil rigs, to watch manufacture processes and rising technologies like electrical phenomenon. They will be employed in firefighting. MQ-6 may be a gas device that is employed during this project.

LITERATURE SURVEY

A number of reviews on the subject of gas leakage detection techniques were done in the past either as part of research papers/technical reports on a certain leak detection method and other gas related subjects.

A. Mahalingam, r. T. Naayagi, n. E. Mastorakis; they introduce design and implementation of an economic gas leakage detector. They gave the formulation of many problems in previous gas leakage detectors. They told that several standards have been formulated for the design of a gas leakage detection system such as IEEE, BS 5730, and IEC. For this work, the recommended UK

safety standards have been adopted. The proposed alarm system is mainly meant to detect LPG leakage, which is most commonly used in residential and commercial premises. The system detects not only the presence of gas (gas leak), but also the amount of leakage in the air, and accordingly raises an appropriate audiovisual alarm. The objective of the system is to detect LPG gases such as propane and butane. The allowed UK level for butane is 600ppm above which it is considered to be of high level and poses a danger.

The proposed system ensures a continuous monitoring of the gas levels. If the gas level increases above the normal threshold level of 400ppm butane (LPG), the system starts to issue early warning alarms at 100ms interval, which implies low level gas leakage. If the leakage level increases to 575ppm of butane (LPG), the system activates high severity audio alarms at 50ms intervals warning the occupants to run to safety. To ensure the user's/occupier's safety, the alarm will not switch off until the level of gas reaches the normal value of 400ppm. These gas leakage levels correspond to the UK occupational safety standards.
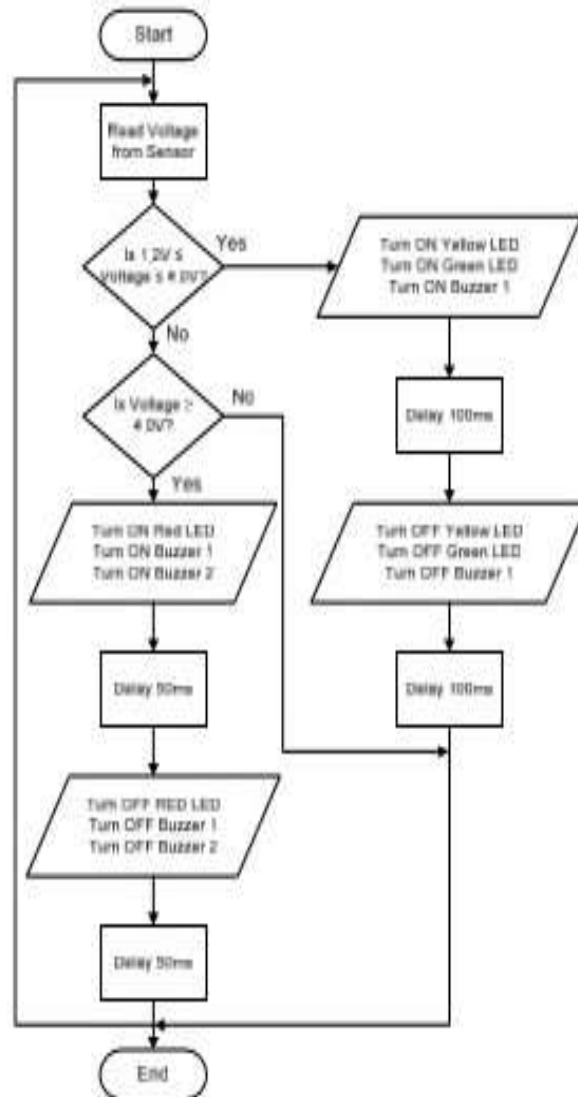
Fig. 1: *Flowchart of the microcontroller function [1].*

The basic diagram of the projected system is shown in Figure one. Any gas leak is detected by the detector and also the voltage output from the detector is fed to the microcontroller for process to supply AN applicable audio-visual alarm. The microcontroller receives a voltage signal proportionate to the extent of gas leak detected (low or high) and drives the minacious system connected with LEDs and buzzers. Bearing in mind the user accessibility and convenience, the system is created to supply each audio and visual alarms. LEDS represent the visual alarms, whereas the buzzers represent the sounding alarms meant to draw the immediate attention of users. The MQ-6 gas detector has been elite as a candidate device that has the flexibility to sense multiple gases. The sensitive material

utilized in MQ-6 gas detector is tin/stannic oxide (SnO2), that has lower conduction in an exceedingly clean air medium. once the target LPG leak is detected, the sensor's conduction rises and will increase proportionately because the extent of gas escape will increase [1]

Prof.M.Amsaveni, A.Anurupa, R.S.AnuPreetha, C.Malarvizhi, M.Gunasekaran; they told in their research paper on "GSM based LPG leakage detection and controlling system" the leakage of LPG gas is detected by the MQ-6 gas sensor. Its analog output is given to the microcontroller. It consists of predefined instruction set. Based on this, the exhaust fan is switched on. So, the concentration of gas inside the room gets decreased. Then, the stepper motor is rotated thus closing the knob of the cylinder. Because of this process, the leakage of gas is stopped. The relay is switched to off the power supply of the house. The buzzer produces an alarm to indicate the gas leakage. Then, the user is alerted by SMS through the GSM module. They proposed their methodology that the system takes an automatic control action after the detection of 0.001% of LPG leakage. This automatic control action provides a mechanical handle for closing the valve. We are increasing the security for human by means of a relay which will shut down the electric power to the house. Also by using GSM, we are sending an alert message to the users and a buzzer is provided for alerting the neighbors about the leakage. [2]
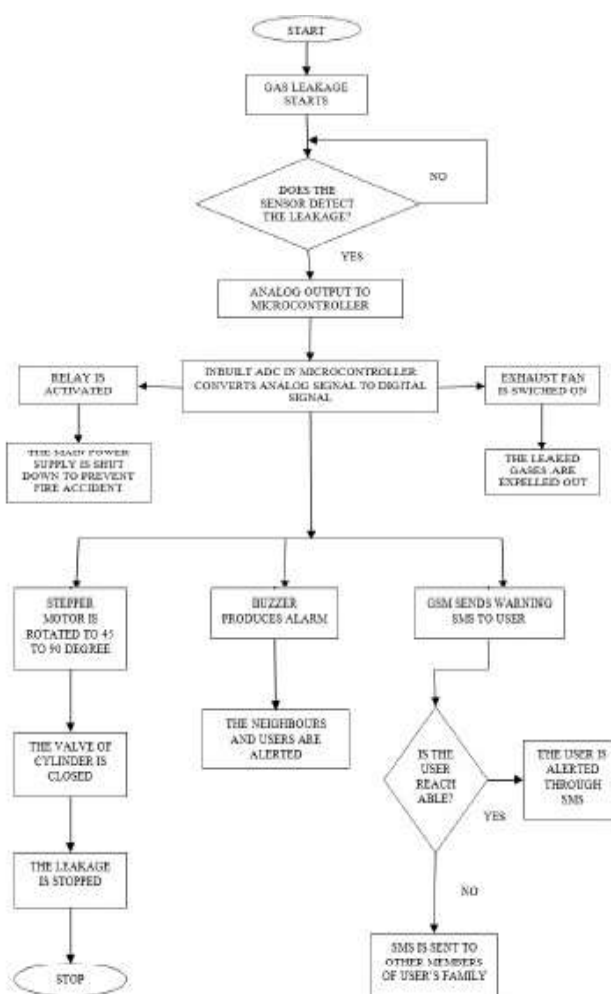
The flowchart is given below

Fig. 2: Flow chart of GSM based LPG leakage detection and controlling system [2].

B. B. Didpaye, Prof. S. K. Nanda; in this paper they told about their research on leakage detection and review of "Automated unified system for LPG using microcontroller and GSM module". Their paper proposed an advance and innovative approach for LPG leakage detection, prevention and automatic booking for refill. In advance, the system provides the automatic controlling of LPG regulator also if leakage is detected the system will automatically turn off the main switch of power supply. Hence it helps to avoid the explosion and blast.
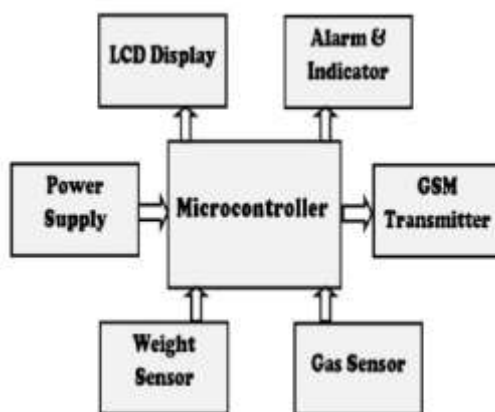
Fig. 3: System block diagram [3].

A System design System diagram contains of following components shown in figure. It consists of microcontroller (ATMega16A), gas detector (MQ-6), weight detector (Load Cell-L6D), GSM module (SIMCOM 300), and display(s). Microcontroller ATMega sixteen is that the base of the system. The inputs given to the ATMega sixteen are the output of gas detector MQ-6, contactor and cargo cell L6D .The output of ATMega sixteen are given to the SIMCOM three hundred and show 16×2 display. An awfully economical and quick operating controller is required to incessantly sense the LPG gas and its level (weight) sensor's output. Conjointly a quick reply is desired once discharge is found. Together with this a system should possess capability to store some info which might be used for additional process. Hence higher than operations need an awfully quick, single cycle execution rate microcontroller like ATMega16A. As shown in higher than figure one, the microcontroller is at the middle the system. It's having options like 16Kb internal RAM creating straightforward storage of entire code in microcontroller itself, conjointly the one unit per rate instruction cycle execution rate increased overall system performance. The show module connected to port B of ATMega16A in 4-bit mode is employed to display the desired messages. GSM module victimization AT commands connected to Rx and Texas pins of port D of ATMega16A are accustomed receive and transmit messages to desired members of the family and distributor. The burden detector module output taken from relay circuit is connected to pins of port A that is employed to incessantly monitor gas level. The contactor is connected to the port C of ATMega16A is employed to dominant the most power offer switch within the home [3].

Srinivasan, Leela, Jeyabharathi, Kirthik, Rajasree; in this research paper they told about gas leakage detection and control. In this paper, the gas leakage resulting into fatal inferno has become a serious problem in household and other areas where household gas is handled and used. It alerts the subscriber through the alarm and the status display besides turning off the gas supply valve as a primary safety measure.
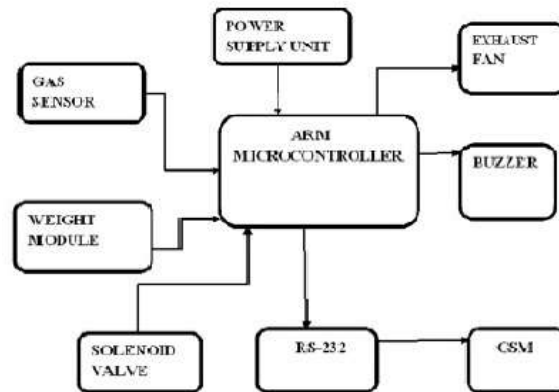
Fig. 4: Gas detector system and control [4].

In this diagram, there area unit 2 sections transmitter and therefore the receiver. however here each area unit gift within the same system. Here the gas detector, weight module, the power offer unit, ARM microcontroller and therefore the coil valve act because the transmitter section whereas the fan, buzzer GSM and therefore the RS-232 cable act as receiver. Here 18v power offer is employed to manage the complete came upon. At the start the ability offer is given to the microcontroller and therefore the gas detector and therefore the GSM. There's conjointly a relay that's mounted that is employed to manage the ability offer to the required part. There conjointly uses a 555 timer that's accustomed management the delay that happens within the circuit. Once the gas leaks, the gas detector gift within the gas detector detects it and send the knowledge to the microcontroller. The LPC2148 microcontrollers area unit based mostly on 32/16 bit ARM7 TDMI-S mainframe core .They have real time emulation and embedded trace support that combines the micro-controller with embedded high speed flash memory of 512kB.A 128-bit wide memory interface and distinctive accelerator design modify 32-bit code execution most clock rate. The

ARM is a 32-bitreduced instruction set computer(RISC) instruction set design (ISA) developed by ARM Holdings. It was noted as the Advanced reduced instruction set computer Machine, and before that as the 32-bit ISA in terms of numbers created. The ARM7TDMI-S is a general purpose 32-bit silicon chip, that offers high performance and terribly low power consumption. The ARM design is based mostly on Reduced Instruction Set Computer(RISC) principles, and the instruction decipher mechanism set and connected decipher mechanism area unit a lot of less complicated than those of microcontroller programmed complicated Instruction set computers(CISC). This simplicity results in a high instruction turnout and spectacular real time interrupt response from a tiny and cost-efficient processor core. The microcontroller provides the data to the coil valve to shut its knob. The coil valve consists of a disc that's in touch with the spring. Once the gas leaks the disc comes in touch with the spring so it stops the flow of gas. Finally the gases area unit thrown out the disc moves so the gas flows. At that point the buzzer starts direful thereby to alert the neighbors. A Buzzer or electronic device is a signal device, typically electronic,

generally used in cars, manage appliances such as microwave kitchen appliance or game shows. It most normally consist of variety of switches or sensors connected to a management unit that determines if and that button was pushed or planned time has irreligious, and typically illuminates a light-weight on the applicable button or management panel, and sounds a warning in the type of a continuous or intermittent abuzz or beeping sound. Initially this device was primarily based on mechanical device system that was identical to an electrical bell while not the metal gong (which makes the ringing noise). Typically these units were anchored to a wall as a sounding board. Another implementation with some AC-connected devices was to implement a circuit to build the AC current into a noise loud enough to drive a loudspeaker system and hook this circuit up to a low-cost 8-ohm speaker. At an equivalent time the message concerning the discharge is additionally sent to the buyer through the GSM. For this a RS-232 cable is employed that transfer the data from the microcontroller to the GSM. At first the network is divided into 3 major systems: the switch system(SS), The base station system (BSS) ,and network (OSS). A GSM electronic equipment is a wireless electronic equipment that works with a GSM wireless network. Awireless electronic equipment behaves sort of a dial-up electronic equipment. The main

distinction between them is that a dial-up electronic equipment sends and receives information through a mounted phone line whereas a wireless electronic equipment sends and receives through radio waves. GSM modems and dial-up modems support a common set of normal AT commands. In addition to this it conjointly support extended set of AT commands. These extended AT commands area unit outlined within the GSM standards. It helps in reading, writing, deleting and causation SMS messages. This can be accustomed convert the data within the parallel communication to the serial communication. In parallel communication only one message is transmitted at a time. However in serial communication all the messages area unit transmitted at the same time. For a security live the fan is additionally on so it throws out all the gases within the area. The GSM is additionally used for automatic booking of the cylinder. Once the burden of the gas goes below a pair of weight unit the message is distributed for the gas agency for automatic booking of the cylinder. This can be through with the assistance of the burden detector that unceasingly monitor the burden of the cylinder by putting the cylinder on top of the burden module. therefore the gas discharge is detected and by continuous transmission of the data they're controlled. [4]

PROPOSED WORK

We have all over from these existing and on top of mentioned technology. We tend to shall use a replacement technology IOT (Internet of Things) to induce quickest notification of gas escape. We tend to shall use a stepper motor to OFF the knob of

cylinder regulator to avoid the accidental cases owing to gas escape. We'll additionally use a web site or application beneath the IOT technology to induce quickest response from the module. the opposite module and things that area unit utilized in this project is GSM module, microcontroller, fan, junction rectifier for

indication, a buzzer to inform native peoples and MQ-6 gas sensing element module to sense the gas escape.

In this proposed model we want to achieve five aspects:

1. To design an embedded system: In this we are going to use the AVR microcontroller that control all the module and things.

2. Accident avoiding feature: In this we will use the exhaust fan to reduce the gas from the place, a stepper motor that can OFF the cylinder knob and for notify the local people automatically weeping the buzzer.

3. GSM module: GSM module is used to send the message of gas leakage.

4. IOT module: This module is used for app notification and controlling the stepper motor via Internet.

5. MQ-6 Sensor: This module is used to sense the gas leakage. In this module we are going to use a sensor MQ-6 to perform the leakage detection operation.

6. Stepper Motor: The stepper motor is used to control the knob of the gas cylinder. When there is a gas leakage then microcontroller will rotate the stepper motor in order to switch off the gas knob.

7. LCD Display: We are going to use an LCD Display for monitoring all the activities that are controlled by Microcontroller.
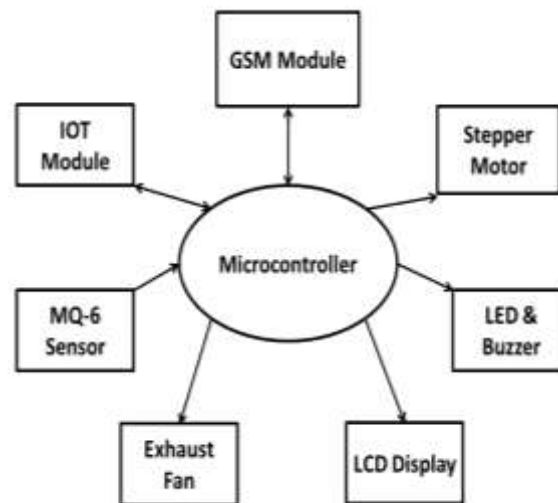

Fig. 5: Block diagram of IOT & GSM Module based Gas leakage detection system [5].

EXPECTED RESULT

Overall this project will be a cost effective which include many functions of detection and controlling of any gas or smoke. The use of MQ-6 over MQ-5 will lead to better sensitivity of the smoke particles present in the air.
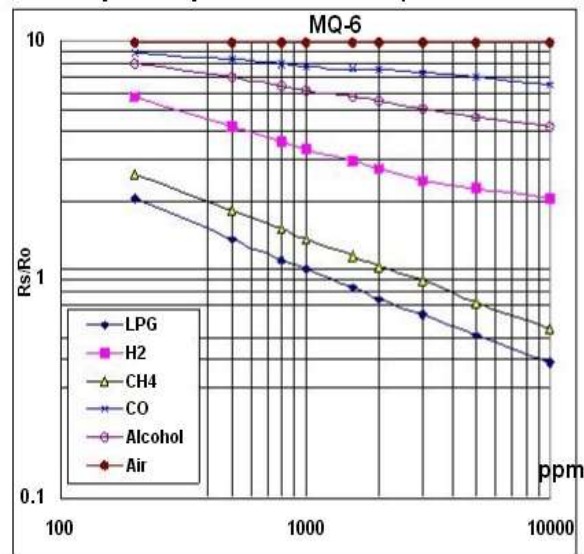
Fig. 6: *Sensitivity characteristics of MQ-6 sensor [5].*

Fig 6 shows the typical sensitivity characteristics of the MQ-6, ordinate means resistance ratio of the sensor (Rs/Ro), abscissa is concentration of gases.

Rs means resistance in different gases, Ro means resistance of sensor in 1000ppm LPG. All test are under standard test conditions.

CONCLUSION

Finally we conclude in recent households, the use of LPG is taking a big troll. From the use of cylinder up to the use of petroleum pipelines. The biggest threat in using this technology is security. And our project will prove to be boom for households and industries. A wide variety of leak detecting techniques is available for gas pipelines. Some techniques have been improved since their first proposal and some new ones were designed as a result of advances in sensor manufacturing and computing power. However, each detection method comes with its advantages and disadvantages. Leak detection techniques in each category share some advantages and disadvantages.

For example, all external techniques which involve detection done from outside the pipeline by visual observation or portable detectors are able to detect very small leaks and the leak location, but the detection time is very long. Methods based on the mathematical model of the pipe have good results at high flow rates while at low flow rates a mass balance based detection system would be more suitable. Hybrid systems benefiting from the real-time detection capability of a software based method and the high localization accuracy of a hardware based technique, along with other specific advantages of both approaches, seem to be the future trend in gas leak detection. Selecting from the wide variety of commercial solutions

available is ultimately an action that has to be taken after assessing the needs of the system in which gas leak detection is needed.

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