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Research Article

GAS LEAKAGE MONITORING SYSTEM OVER IOT

Anjaiah A, Kannareddy Rakshith Reddy, Ramidi Ashish Kumar Reddy and Harshavardhan

Department of Computer Science Engineering, St. Peter's Engineering College, Kompally, Hyderabad, Telangana

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A B S T R A C T

Now-a-days gas leakage and gas detection is a major problem in our daily lives. Also gas wastage is a major issue that needs to be countered. LPG gas is highly flammable and can inflict damage to life and property. To avoid such situations, a considerable amount of effort has been devoted to the development of reliable techniques for detecting gas leakage. As knowing about the existence of a leak is not always enough to launch a corrective action, some of the leak detection techniques were designed to allow the possibility of locating the leak. Our aim is to reduce the risks in Kitchen using Internet of Things. The main aim is to propose the design and construction of an SMS based Gas Leakage Alert System. Gas sensor is used to detect gas leakages in a kitchen. With the help of an 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.
In this we analyzing the gas leakage using gas sensor, it detect gas range and gives to the microcontroller. If the gas leakage range is high, controller will send the position of gas leakage to authority with range of gas leakage, so that we can take the immediate action towards. To find the position we used GPS module, to send SMSwe used GMS module, to send gas detecting leakage values and potting location to server we used Wi- Fi module.

INTRODUCTION

There have been many incidents like explosions and fire due to LPG gas leakage. Such incidents can cause dangerous effects if the leakage is not detected at an early stage. IoT based gas leakage detection system is a project which will help in determining gas leakage in the surrounding and send data to an IOT module.[1]

Internet of Things (IoT) is the networking of 'things' by which physical things can communicate with the help of sensors, electronics, software, and connectivity. These systems do not require any human interaction and same is the case with IoT based gas detection system, it does not require human attention.IoT based LPG leakage detection system senses the LPG gas with the help of an LPG gas sensor. LPG gas sensor interfacing with Arduino is implemented in this project. The Signal from this sensor is sent to the Arduino microcontroller. The microcontroller is connected to an LCD, Buzzer and Wi-Fi module.IoT based LPG leakage detector project is implemented using an ESP8266 chip. This is Wi-Fi modules which is used for connecting microcontrollers to Wi-Fi network and make TCP/IP connections and send data. Data, which is sensed by these sensors, is then sent to the IoT.The Wi-Fi module then sends the data over to a website. Once the gas leakage is detected, the buzzer is turned ON and a 'Leakage detected' message is displayed on the LCD and an SMS will be sent to the owner by using GSM module. [1][2] This proves really helpful in cases when there is nobody in the house which has LPG gas cylinder in it. Due to some negligence there might be LPG gas leakage which can lead to measure accidents. By using this we can avoid such situations by sending an alert SMS to the owner and by turning on Buzzer/Siren at the same time. [2]

Corresponding author:* **Anjaiah A
Department of Computer Science Engineering, St. Peter's Engineering College, Kompally, Hyderabad, Telangana

System Architecture

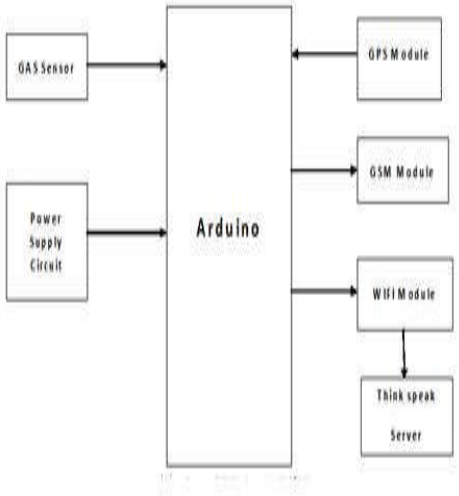

Fig 1 Block Diagram

The above block diagram shows the outlay of the entire paper which has been discussed above the hardware requirements are quite limited & easily available as well as less feasible. The gas container is placed on the Load Cell and it constantly keeps on sending the electric pulses to the microcontroller. [3]In gas leakage detection process, any gas leakage is checked by gas sensor which is interfaced with Arduino UNO. When leakage is detected it will sends an alerting message to the owner, the system will turn on the buzzer and also displaying the message on LCD. [2][3]

Hardware Description

Arduino UNO

The Arduino UNO is a microcontroller board based on the ATmega328. It uses an ATmega16U2 faster transfer rates and more memory. Arduino can be used to develop stand-alone interactive objects or can be connected to software on your computer. It uses Arduino IDE (Integrated Development Environment) software which allows you to write programs and upload them to your board. A program written with the IDE for Arduino is called a sketch. [3][4]

Features

a. Input voltage: 7-12V
b. 14 Digital I/O Pins (6 PWM outputs)
c. 6 Analog Inputs
d. 32k Flash Memory
e. 16 MHz Clock Speed

GSM Module (SIM900A):

GSM module is used to establish communication between a controller and a GSMGPRS system. It requires a SIM card just like mobile phones to activate communication with the network. Also, they have IMEI number similar to mobile phones for their identification. [4]

Features

a. Dual-Band 900/1800 MHz
b. Control via AT commands
c. Operation temperature: -40°C to +85°C
d. Supply voltage range: 3.2V to 4.8V
e. Low power consumption: 1.0mA.

GPS Module

NEO-6M GY-GPS6MV2 GPS module features the u-blox NEO-6M GPS module with antenna and built-in EEPROM. This is compatible with various flight controller boards designed to work with a GPS module. The NEO-6 module series is a family of stand-alone GPS receivers featuring the high performance u-blox 6 positioning engine. These flexible and cost effective receivers offer numerous connectivity options in a miniature 16 x 12.2 x 2.4 mm package. Their compact architecture and power and memory options make NEO-6 modules ideal for battery operated mobile devices with very strict cost and space constraints. The 50-channel u-blox 6 positioning engine boasts a Time-To-First-Fix (TTFF) of less than 1 second. The dedicated acquisition engine, with 2 million correlates, is capable of massive parallel time/frequency space searches, enabling it to find satellites instantly. Innovative design and technology suppresses jamming sources and mitigates multipath effects, giving. NEO-6 GPS receiver's excellent navigation performanceevenin the most challenging environments. [4][5][6]

Wi-Fi Module

ESP8266EX (ESP- Espressif Systems Smart platform; EXrevised version) offers a complete and self-contained Wi-Fi networking resolution, it can be used to host the application or to offload wireless networking functions from another application to the processor. ESP8266EX hosts the application it picks up directly from an external flash; it has integrated cache to improve the performance of the system in such applications. Alternately, serving as a Wi-Fi adapter, wireless internet access can be added to any micro controller-based design with simple connectivity (SPI/SDIO or I2C/UART interface). it integrates the antenna switch, RF module, power amplifier, low noise receive amplifier, filters, power management modules, and the entire solution, including front-end module, is designed to occupy minimal PCB area. ESP8266EX also integrates an enhanced version of Tensilica's L 106 Diamond series 32-bit processor, with on-chip SRAM, besides the Wi-Fi modem properties. ESP8266EX is often integrated with external sensors and other application specific devices through its GPIOs, so as it can be made to work as an entirely individual system even if required. [6][7]

Gas Sensor

The MQ-6 is a semiconductor gas sensor that detects the presence of LPG, Iso-butane, and Propane gas. The sensor can operate at temperatures from -10 to 50°C and consumesless than 150 mA at 5V. [7][8]

Features

a. High Sensitivity to LPG, Iso-butane, propane.
b. Small sensitivity to alcohol, smoke
c. Detection Range: 100 - 10,000 ppm
d. Fast Response Time: <10s

Buzzer

Buzzer is use to indicate that gas leakage has occurred.A buzzer is an audio signaling device, which may be mechanical, electromechanical, or electronic. Typical uses of buzzers and beepers include alarms, timers and confirmation of user input such as a mouse click or keystroke. [8][9]

Working Procedure

- To run all the modules we need +5v DC power, to get the required voltage we need power supply circuit, so we converting 230v AC mains to +5V DC.
- Arduino controller is connected to all modules; each module is executed with respective commands given by Arduino.
- Insert the SIM in the GSM module to send alert SMS.
- Connect the Wi-Fi module to the mobile hotspot, so that we can send the values to the server. Here we are using Thing Speak server to monitor the gas leakage values send the controller.
- As soon as we give the power supply, all the modules get activated by the controller.
- GPS will track the Latitude and Longitude values of that particular position.
- Gas sensor will check the any leakage if no leakage, sensor value is given to the controller. MQ 6 is the

sensor to detect the LPG, Propane and butane gases.

- After getting the sensor value controller will send the zero values to the thing speak server to monitor through Wi-Fi module.
- If any gas leakage is present immediately controller will activate the buzzer, send an alert SMS to the user to notify the leakage with latitude and longitude, so that we can track the location, meanwhile the value 1 and latitude and longitude values are send to the thing speak server.

CONCLUSION

Hence, from the above discussion we can conclude that the paper (Gas Leakage Monitoring over IoT) is absolutely ethical for the application of the users who consume (use) gas in their daily life. It not only helps in making the work easier but also plays a major role in the security / avoidance of accidents to the user and helps in leading an easy life.

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