IOT based smart LPG Leakage Detection System using Arduino

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Abstract - *Many accidents occur due to gas leakage to avoid such accidents a gas leakage detector is required.*

This IOT based gas detector connects the device to WIFI which is utilized to set parameters. Because of its small size and portability it can be installed in hotels, households and industries.

This gas detector system uses MQ5 gas sensor and continuously monitor the LPG level in its surrounding. If the level of LPG is within threshold then it gives green signal, if not, it will give red signal and will update it over IOT device.

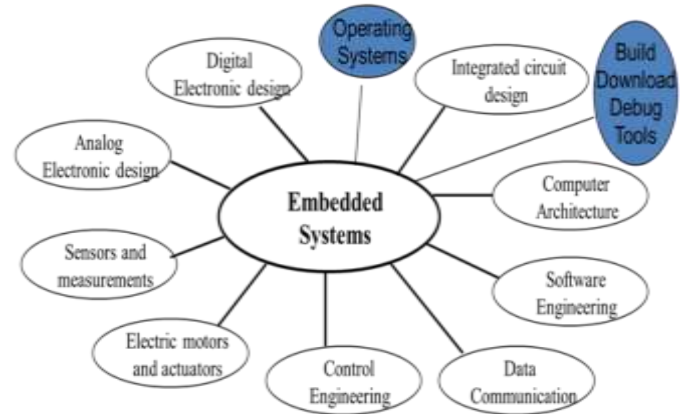***Key Words:*** IOT(Internet of things), MQ5, LPG(Liquid Petroleum Gas)

1. INTRODUCTION

The following project is based on embedded system. When both hardware and computer software are present in a system it can be described as an embedded system. An embedded system uses some additional moving parts to perform some specific work.

The features of embedded system are that it is reliable, autonomous, real-time control system and operates on diverse physical variables and in wide ranged environment. Embedded system are categorized in two types:-

a. High-end embedded system:- 64, 32 bit controllers utilized with OS. Example:- PDA and smartphones, etc.
b. Lower-end embedded system:- 8, 16 bit controllers utilized with minimal OS and hardware layout designated for specific function.

Fig 1: Embedded System

2. EMBEDDED SYSTEM

It cannot be considered as a computer system that is used only for manipulating and processing data, business or scientific application. An embedded system is like a backend to computer system.
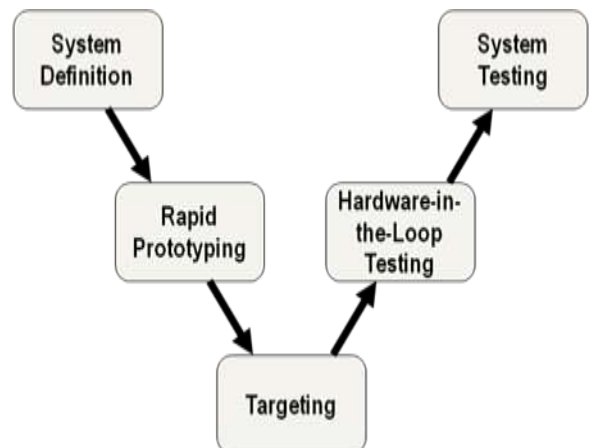

Fig 2: Design sequence of Embedded System

2.1 Applications of Embedded System

Embedded System has applications in many diverse fields, such as

- Military and Aerospace
- Communications
- In industries for automation and process control
- For intelligent and autonomous sensors in robots

3. IOT

IOT makes the network which connects different devices to embedded sensors, network connectivity, and necessary electronic to exchange data and gives command to make them more responsive.

IOT also works as an architectural outline which allows integration and data exchange to interact between the physical world and computer systems over existing network communication.

In simple words, IOT enables the control or review of devices through any other device connected to the internet.

3.1 Necessary Components for IOT

The components that are necessary for IOT:-

1. Hardware:- They are the tangible object which comprises the structure, the input and output devices
2. Software:- It is the non tangible object in which does processing, data collection and manipulation of the input data
3. Communication Network:- It is the network which connects two or more devices to interchange data and results

4. ARDUINO

Arduino is an open source platform which provides both hardware and software that is useful for making prototypes and projects.

It is an open source platform where people, from different fields such as artists, musicians or any other who are not familiar with electronics and programming, can do rapid prototyping.

Arduino microcontroller works just like a computer CPU, it gathers input, processes that input and gives suitable output. The microcontroller can be programmed using Arduino IDE which is written in Java and also supports C and C++.

5. GAS DETECTION

Gas Detection can be done by gas detection sensors. These sensors can be classified accordingly:-

1. On the basis of type of gas detection
   a. Toxic gas detector
   b. Combustible gas detector
2. On the basis of technology they use
   ➤ For toxic gases,
   a. Electrochemical sensors
   b. Metal Oxide semiconductors
   ➤ For combustible gases,
   a. Catalytic sensor
   b. Infrared Sensor

6. COMPONENTS

Arduino Kit:- A 8 bit microcontroller with 32 pins arduino kit is used in this system. It has 40 ports and 3 built-in timers(two 8 bit and one 16 bit). Its clock speed is 16 MHz which can be obtained by external Quartz crystal or ceramic crystal.

Wi-Fi Module:- A Wi-Fi module is used to setup connection between user and device through internet.

ESP8266 Wi-Fi module is used because it supports APSD and Bluetooth. It does not need any external RF parts because it has a self-calibrated RF.

LCD Screen:- A LCD screen can be used to display output. A 16x2 display is used because it is commonly available. 16x2 means 16 characters can be displayed per line in a 2 line display.

Gas detection sensor:-A MQ-5 gas detection sensor is used in this system. It is a semiconductor based combustible gas detection sensor. It's range of detection is 100 PPM to 3000 PPM.

Buzzer & LED:- A buzzer is utilized to produce a high sound when gas leakage is detected which further alerts the user.

A LED bulb is also present in case the buzzer sound gets damped or it stops working.

Fan:- It diffuses the concentration of the already leaked gas to evade any future accidents.

7. LITERATURE SURVEY

In past years many smart gas detector have been proposed to detect leakage of LPG efficiently. Some use different sensors like MQ6 in place of MQ5 [1]. Some programmed the system such way that it sends a text message to notify the user [2] or to shut off the gas line automatically [3]. Some even used GSM and Wireless monitoring system [4]. This paper discuss about the real time observation of gas concentration in the surrounding and avoiding any future accidents.

8. WORKING OF PROPOSED MODEL

The arduino microcontroller is the main component; all the other parts are connected to it. It is programmed in such a way that when the MQ5 sensor detects LPG gas and informs the microcontroller which further commence the alerting procedure.

In the alerting procedure, the buzzer starts making sound and the LED starts blinking red which alerts the nearby user. The LCD screen displays the concentration of leaked LPG in the surrounding while the fan will diffuse the gas and also work as exhaust.

The WI-FI module, which connects the system to the internet can be used to observe the gas concentration on real time basis and will also record past changes in gas concentration. It can also be integrated with Google Home or Amazon Echo to make it part of smart home.

When the concentration of LPG is under the specified threshold the alerting procedure will stand by and the system will work normally.
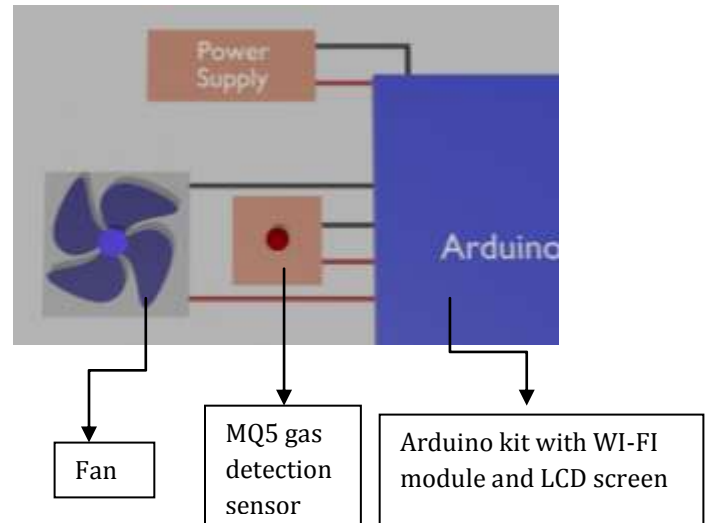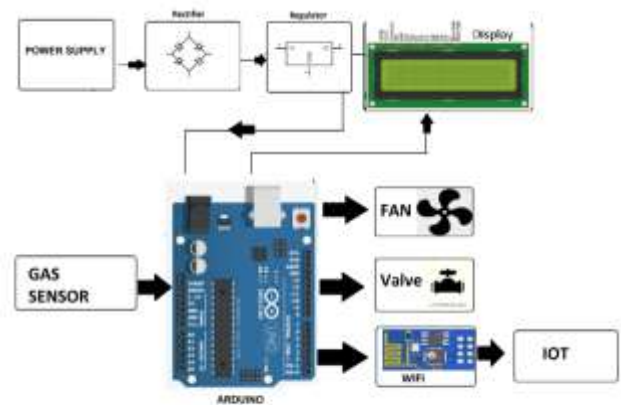

Fig 3: Model of Proposed System

Fig 4: Block Diagram of System

9. CONCLUSION

We can conclude from above prototype that if one uses Arduino and IOT effectively then they can create an efficient embedded system by utilizing the present input and output along with the gas detection sensor. This project is more efficient as we can connect it to common webpage to alert the user of gas leakage. Nowadays gas leakage is a big issue thus this project provides the best application of technology to tackle this issue.

10. REFERENCES

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