IoT Based Gas Detection System
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Abstract:
Places like industries, hotels, canteens, laboratories, etc. make use of various kinds of flammable gases for example, LPG, carbon dioxide, ammonia, etc. The use of these gases puts all the places mentioned above at risk leading to a threat to damage of life and property due to any kind of leakage of these gases. Safety becomes of utmost importance. This factor leads to a necessity of a gas detection system to be installed at such accident-prone locations for continuous monitoring of any kind of leakage which cannot be detected by the human senses. The proposed system will continuously monitor the surroundings for any leakage. In case of any leakage detection, it will alert the user via a buzzer and by using the Ethernet shield module and an Android application; it will alert the user about the environmental conditions like the gas level and temperature of that location of installation using social media sites like Twitter or via an email notification.

Keywords: gas detection, leakage, alert, prevention

I. INTRODUCTION

Safety plays an important role in today’s world as accidents are prone to happen anywhere. Places which make use of flammable and not easily detectable gases are prone to occurrence of accidental fires. The Internet of Things is a futuristic technology in which interconnection of devices and the Internet is proposed. The automation of many daily chores can be made possible by this. In the proposed gas detection system, we will make use of IoT to detect leakage and alert the user along with preventing any further leakage of the gas. Toxic gases are one that cause serious health impacts, but are also used in industries in large quantities. These gases have to be monitored; such that increase in the normal level of them could be known and proper precautionary measures can be taken. Arduino will be used to perform the desired task by interfacing gas sensor, buzzer and LCD to display, ethernet shield to send alert message to the user via an Android application and servo motor to close the gas valve. The system will detect the gas leakage by using gas sensor and it will inform the Arduino board which will carry out the further actions i.e. ringing buzzer, closing gas valve, turning on exhaust fan.

II. PROBLEM STATEMENT

The requirement of a gas detection system is not only to monitor the surroundings continuously but also needs to prevent the further leakage of gas in the environment to minimize the chances of fire. Leakage of any type of gas has become a problem in present times whether it is in regards to a domestic household, factory, kitchens in restaurants, canteens, etc. A gas leakage detection system makes use of gas sensors (depending on the requirement of the place). The proposed system makes use of an MQ6 sensor for detection of LPG leakage. The primary objective of the present project is to provide a novel means for safely detecting any malfunction of a pressurized gas system in order to prevent accumulation of combustible gases so that damage or explosion due to such an accumulation of gases is prevented.

III. LITERATURE REVIEW: In reference to [1], two main modules i.e. the detection and transmission module and the receiver module are used. The former module is sued for detecting the change in the concentration of the gas by making the use of a sensing circuit which is built for this purpose. Whether the gas concentration has exceeded a certain predefined threshold or not is checked in this module. On sensing a change in the concentration of the gas, an audiovisual alarm is activated and a signal is sent to the receiver module. Mobility within the house is allowed with the receiver module acting as a mobile alarm device. This system used LPG for testing and after changes in the gas concentration, the alarm was triggered. This system makes use of PIC-16F877 microcontroller and RF transceiver. In reference [2], This system is put together for monitoring leakage of gas and preventing any leakage. The system can be divided into three modules or steps. Firstly, the MQ6 gas sensor senses any leaked gas. Secondly, the gas sensor sends a signal to the ARM controller. After this, an activation signal is sent by the microcontroller to the devices attached to it externally. Lastly, various functions by devices like buzzer, exhaust fan, sprinkler are performed and the GSM module is activated which then sends SMS to the already specified mobile numbers. This system makes use of GSM module and an ARM based microcontroller LPC2148. In reference [3] In this system, a home automation system is proposed using Arduino, which is a low cost microcontroller and an Android mobile phone. The programming of Arduino can be done in such a way that it can receive keyboard input or sensor data for controlling a number of electrical appliances which are connected to output peripherals. With mobile phone being a wireless communication device, the Arduino and smart phone are connected using Bluetooth which is a short range wireless communication technology for indoor environment. Wireless connectivity is established using an external HC-05 Bluetooth module as there is no in-built Bluetooth radio in an Arduino micro-controller unit. On the connection of the home appliances to the Arduino board, they can be easily controlled inside a smart home using any Bluetooth enabled smart phone.

IV. PROPOSED SYSTEM

The proposed system (fig. 1) makes use of ATmega 328 microcontroller. Arduino UNO board is used as a base for the whole system. The system consists of an MQ-6 gas sensor...
attached to it along with a thermostat. These two devices sense the gas levels and the temperature of the surroundings where the system is installed and show the output i.e. the readings on an LCD display. An Ethernet shield is attached to the Arduino UNO board which is loaded in the program code for sending alert to the user. Once the gas levels increase above a predefined level (250 PPM for the proposed system), the device sends an alert notification to the user. The user can control devices attached to the system via a relay like, exhaust fan, light bulb, buzzer/alarm and a motor for closing the gas valve. These devices can be switched on/off by the user using an Android application which supports the Arduino configuration (Blynk application).

![Figure 1. Microcontroller](image)

**MICROCONTROLLER:** Based on the ATmega328 (datasheet), the Arduino Uno is a microcontroller board. It consists of 14 digital input/output pins (of which 6 can be used as PWM outputs), a 16 MHz crystal oscillator, 6 analog inputs, a USB connection, an ICSP header, a power jack, and a reset button. You just have to simply connect it to a computer with a USB cable or power it with an AC to DC adapter or battery to get started as it contains everything it needs to support the microcontroller.

**GAS SENSOR:** The MQ6 is an easy-to-use LPG (Liquefied Petroleum Gas) sensor which is highly suitable for sensing LPG, which is mainly composed of butane and propane, concentrations in the air. Gas concentrations of anywhere from 200 to 10000 ppm can be detected by MQ6 sensor. The sensor comes with a very high sensitivity and a fast response time. The output of this sensor is an analog resistance. You only have to power the heater coil with 5V, add a load resistance and connect the output to an ADC, which makes the drive circuit very easy.

**ETHERNET SHIELD:** An Arduino board can be connected to the internet by using an Ethernet Shield. This shield is based on the Wiznet W5100 ethernet chip. A network (IP) stack capable of both TCP and UDP is provided by the Wiznet W5100. Upto four simultaneous socket connections are supported by it. The Ethernet library can be used to write sketches which connect to the internet using the shield. By using long wire-wrap headers, which extend through the shield, the Ethernet shield can be connected to the Arduino board. By this, the pin layout can be kept intact and another shield can be stacked to the top.

**ANDROID APPLICATION:** Blynk is a platform available with iOS and Android apps used to control Arduino, Raspberry Pi and the likes over the Internet. Blynk is a digital dashboard which lets you build a graphic interface for your project by simply dragging and dropping widgets.

**V. CONCLUSION**

The proposed system makes the gas detection and its prevention easier for kind of user, whether technically sound or not. This system wirelessly transfers alert notification to the user and the user can easily connect the devices through a smartphone from any location. This easy control over the devices like exhaust fan makes the surroundings less accident-prone. Using the Arduino microcontroller also makes the system cheaper. Easy access and control makes the system very useful.

**VI. REFERENCES**

