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LPG Gas Leakage Detection using Arduino

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Abstract
Leaking of gas is the major problem with industrial sector, domestic areas and vehicles run by CNG gas.Due to leakage of LPG gas, itproduces hazardous and toxic impact for living things. LPG and natural gas is highly combustible and can burn even at some distance from the source of outflow. One of the preventive measures to stop the explosion and danger is to install the leakage detection kit. The main aim of this paper is to present the detection of leakage, alert the danger to people and neutralize the gas to prevent from explosion. The gas will be detected by using MQ6 gas sensor.It will immediately turned on the LEDs, buzzer and LCD displays message to alert the maximum number of the people. The system includes a GSM module which makes the owner to notify the danger.It will also turn on the automatic opening of the window and exhaust fan to send the gas out and neutralize the concentration. These systems are controlled by Arduino platform.

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I. INTRODUCTION

Natural gas has been the most vital want non-renewable resources. The human race is over-exploiting this resource in critical amounts. Fractions of propane, butane, propylene, butylene, isobutane and mixture of hydrocarbon gases combines to form LPG gas which is highly inflammable. LPG gas is odourless by its property which increasing the risk by not being detected in terms of smell. Major problems due to gas leak is blasts explosions and accidents. It has numerous industrial and domestic usages since past decades, if a leak occurs and if gas meets a tiny source of ignition, massive damage can take place.Gas leakage security framework become very useful and healthy to shield from further gas discharge misfortunes. Safety plays a major role in today's world and it is necessary that could safety systems are to be implemented.

II. LPG Gas leakage detection using Arduino

In the world of LPG gas users, the gas leakage problems and accidents are increasing drastically. Whenever the spillage of LPG gas occur, the gas sensor is used to detect the leakage of gas. The Arduino will alert the buzzer, LEDs, LCD display. It sends the SMS alert through GSM module.

2.1 Proposed System

In the proposed system of 'LPG Gas Leakage Detection using Arduino' will be great help in preventing explosions and blasts. Apart from sound alarm and SMS alert it will also turn on exhaust fan and automatic opening of window by the mechanical force using servo motor. This helps to remove the leaked gas in room, which is used in case of nobody is present when the leakage occurs and to prevent accidents and property.

2.2 Block diagram

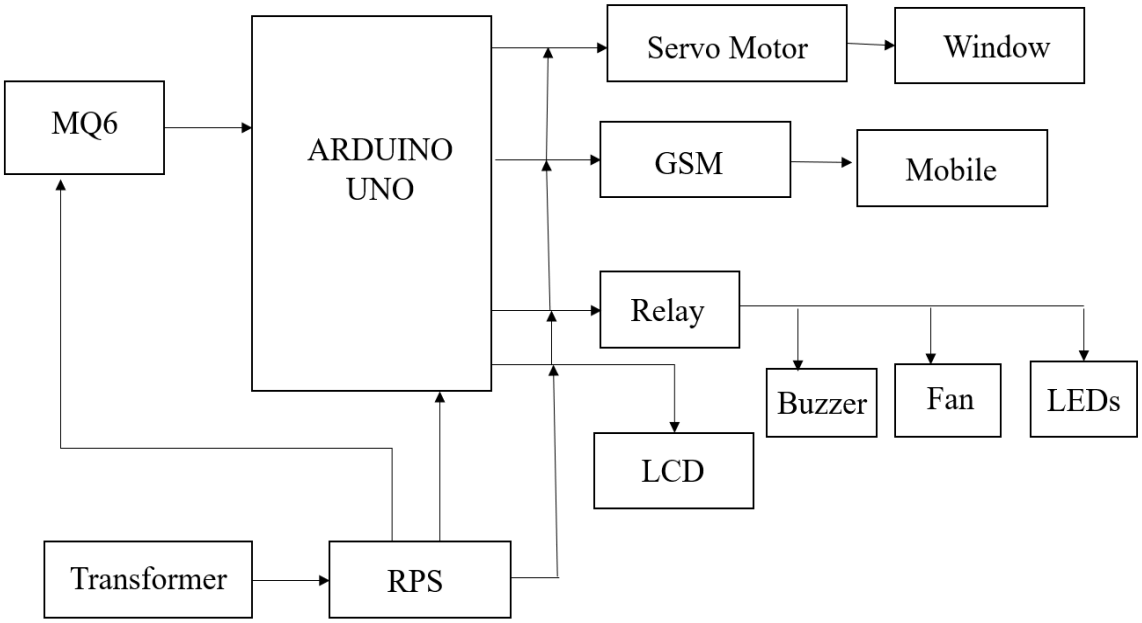


Fig:1 Block diagram of Proposed System

The way this tool works is when gas is sensed by gas sensor according to the LPG gas level it detects. The higher the LPG gas is detected, the higher the voltage released. When the sensor output is moved the presence of gas, then Arduino will activate, and activate the buzzer and display the writing on the LCD stating the gas is high, which means there has been a gas leak, then the GSM SIM800L module will send anotification message to the handphone number specified in theprogram.

However, if the sensor does not detect a leak, the sensor will not remove the output, and the sensor will continue to work until it is proven that there is an LPG gas leak. When the program is run the system will immediately detect LPG gas detected by the sensor. Then the Arduino microcontroller will read LPG gas through an LPG gas sensor. If it detects a gas leak, the red LED will light up, the buzzer will activate, the window will open automatically by utilization of servo motor, and also running of exhaust fan to neutralize the leakage, then the system will send a notification message stating that there has been an LPG gas leak. After solving the problem of detection, the green LED will glow, which indicates there is no further trouble. If no LPG gas leak is detected, the system will continue to detect the gas level through the LPG gas sensor until it detects an LPG gas leak.

III. HARDWARE DESCRIPTION

3.1 Arduino Uno

The Uno with Cable is a micro-controller board base on the ATmega328. It has 14 digital input/output pins (of which 6 can be used as PWM outputs); 6-analog inputs, a 16 MHz ceramic resonator, a USB connection, a power jack, an ICSP header, and a reset button. It contains everything need to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started. "Uno" means one in Italian and is the name to mark the upcoming release of Arduino 1.0. The Uno and version 1.0 will be the reference versions of Arduino, moving forward. The Uno is the latest in a series of USB Arduino boards and the reference model for the Arduino platform; for a comparison with previous versions, see the index ofArduino boards. Note: The Uno R3 reference design can use an Atmega8,168, or 328, Current models use an Atmega328, but an Atmega8 is shown in the schematic for reference. The pin configuration is identical on all three processors.

Fig:2 Arduino Uno

3.2 MQ Sensor

The MQ-6 sensor is capable of detecting a wide range of gases including carbon monoxide, alcohol, methane, hydrogen, isobutene, liquefied petroleum gas, propane, and smoke in the range of 200-10,000 ppm. For the easy interfacing, the MQ- 6 sensor Module is provided with 4 male headers so that it can be easily interfaced with the Arduino Uno or Mega using male to female type jumper wires**.** MQ-6 SENSOR PINOUT. As you can see the 4 male header pins are labelled with A0,D0, GND and Vcc.

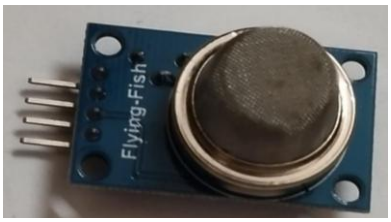


Fig:3 MQ Sensor

3.3 GSM Module

SIM800L GSM module is employed to send SMS alerting on gas detection. GSM is meant as a device used for exchanging the information. SIM card is recovered from the GSM to control the wireless node 5 volts of the DC supply is required by the GSM for functioning. The modem needs only three connection (transmitter, receiver, ground) to interface with Arduino controller Atmega-328 the excess power supply is used. Arduino microcontroller is connectedwith the receiver pin to the device. The Arduino provide information to the GSM device. The GSM will send an output to through the SIM inserted into its SIM slot to number written into the code to alert about the leakage of the LPG gas or the other gas sensed by the sensor.

Fig:4 SIM800L GSM Module

3.4 Buzzer

The buzzer will be used to emit sounds to alert users during leakage. A buzzer or beeper is a signalling device usually electronics, that is most commonly consists of a number of switches or sensors connected to a control unit that determines if and which button was pushed or a pre-set timehas lapsed, and usually illuminates a light on the appropriate button or control panel, and sounds a warning in the form of a continuous or intermittent buzzing or beeping sound. Initially this device was based on an electromechanical system which was identical to an electric bell without the metal gong.

Fig:5 Buzzer

3.5 LCD (Liquid Crystal Display)

LCD is employed for displaying the message indicating that "gas detected at zone" into the display, which is initially coded in program to display the danger. The message been displayed on the LCD, data and command both are register of LCD and it's shown in fig.5. The register selects is employed to modify the registers. data register RS=1, whereas for the command register RS=0 is employed.

Fig:6 LCD display

3.6 Exhaust Fan

The exhaust fan gets operated when the gas sensor detects the gas. It is used to send the leaked gas of some part out of the room. Hence, it is helpful in preventing from further explosion.

Fig:7 Exhaust Fan

3.7 Servo Motor

A servo motor is a type of motor that can rotate with great precision. Normally this type of motor consists of a control circuit that provides feedback on the current position of the motor shaft, this feedback allows the servo motors to rotate with great precision. If you want to rotate an object at some specific angles or distance, then you use a servo motor. It is just made up of a simple motor which runs through a servo mechanism**.** If motor is powered by a DC power supply then it is called DC servo motor, and if it is AC-powered motor then it is called AC servo motor.A servo motor usually comes with a gear arrangement that allows us to get a very high torque servo motor in small and lightweight packages. Due to these features, they are being used in many applications like toy car, RC helicopters and planes, Robotics, etc.

Fig:8 Servo Motor

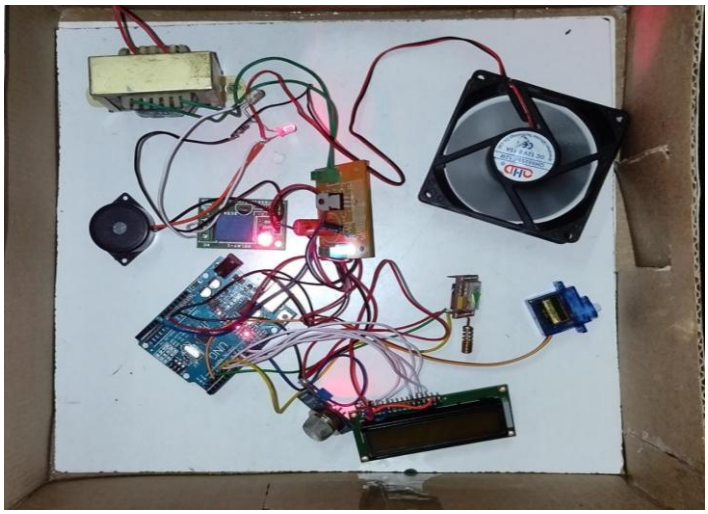
3.8 Relay

A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts in multiple contact forms, such as make contacts, break contacts, or combination.

Fig:9 1-Channel Relay

IV. RESULT

The device was tested placing the LPG device at leaked area . We obtained the results as expected since the system was built as expected according to plan. After gas is sensed the red LED glows, buzzer sounds, LCD displays message, GSM sends notification to users then exhaust fan runs and opens the window to neutralize. After there is no gas leak, every components stops a triggering and green LED glows indicating no threat.



V. CONCLUSION

After going through this project survey, it can conclude that detection of the LPG gas leakage is incredible in the project system. And it is necessary to provide the gas leakage protection system for various applications like industrial and domestic users in daily life. In danger situations we are able to save the life by using this system. An alert is indicated by the GSM module. A sensor node senses gas like CO2, oxygen, propane. The estimated range of transmission and consumption of power is obtained. The simple procedures and Arduino UNO Micro controller area used to build the sensor.

In future, this device can be reached out to various sectors and has ample possibilities to stand out. The sensor can be utilized to be familiar with more different variety of gas spillage. Once notified they can combat the fault and stop any further accidents from taking place. This may yield fruitful result in tackling such

mishaps. Additionally we also plan on making it portable, so that the users can carry it anywhere and employ this device. By using an advanced GSM technology or Raspberry PI, we plan to embed the nearby location of the fire service automatically into the system through the Internet wherever it is taken by the user. So that the device upon detecting the new location can automatically sync the details of the local authorities into it which may be overall more effective; hopefully, accidents anywhere can easily be stopped through this device now. Considering all the prospects, we can introduce this device furthermore into the poultry farms as our device is designed to combat gas leakage in mostly closed places.

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