Detecting LPG Leakage and Automatic Turn off using Arduino Connected with PIR Sensor

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Abstract. In today’s world, every home is provided with separate LPG connection for cooking. Nowadays, due to the advancement in technology human beings are getting upgraded day by day. In today’s world, every home is provided with separate LPG connection for cooking. It increases the efficiency and decreases the time consumed. Even though it is much better, there are certain critical conditions are to be considered when leakage occurs. While operating with LPG, risks are considered and a reliable technique is to be adapted in the kitchen. Many techniques are available to provide constant monitoring and control of gas leakage in residencies. This paper describes one such method of utilizing LPG in home safely and automatic turning off of the valves at the time of leakage. In this paper, I have used Arduino UNO to carry out the desired task. Arduino is connected to gas sensor (MQ-2) and temperature sensor (LM-35). Gas sensor is used to detect leakage of gas and temperature sensor is used to detect temperature constantly. In addition to that, I have used a PIR sensor for detecting the presence of human in the kitchen. If no human is detected over a period of time, an alarm is on and automatically the valve of the LPG cylinder goes off.

1. Introduction
The growing technology is very much useful in everyone’s life, but it is to be noted that preventive measures are to be undertaken for ensuring safe operation. LPG is used for cooking. It is a flammable mixture of hydrocarbon gases which is used in cooking, vehicles, etc. LPG cannot be dispersed easily and it is heavier than air. It leads to suffocation when inhaled.

When leakage occurs, suddenly ignites which may lead to explosion. Large amount of gases is being wasted due to the carelessness of the consumers. Many accidents are occurring mainly due to the leakage of LPG in residential areas. Accidents often occurs when the resident is not in the kitchen due to certain reasons. An efficient technique is required to avoid those accidents. This paper finds a solution for it.

When leakage occurs, it is necessary to control the risk effectively before causing damage to the residencies. In this proposed system, when leakage is detected, message is sent to the user immediately and the cylinder valve is turned off automatically. The automation is done in order to provide more safety and avoid human interference. Arduino UNO is interfaced with the gas sensor, temperature sensor, PIR sensor, relay and exhaust fan.
The figures shown above are the components utilized in this technique. Arduino UNO is useful and more flexible for advanced applications. It runs on Mac, Windows, Linux. In this proposed system, Arduino is connected to the gas sensor, temperature sensor, PIR sensor, relay, buzzer and LCD display.

When leakage occurs, gas sensor detects leakage and sends signal to the controller which closes the valve automatically. The temperature sensor gives an output voltage proportional to the temperature. It is used in most of the places to detect the high change in temperature and in turn sends the signal to the controller.

The PIR sensor detects the presence of human near the stove. It emits the electromagnetic field and wait for the changes in the field or return signal. When no human is detected over a period of time, then the valve goes off automatically as the PIR sensor gives signal to the micro controller.

An exhaust fan is interfaced with the controller and when leakage occurs, it is turned on to evacuate gases inside the kitchen. When there is no power supply, leakage cannot be detected and it will cause a failure. A battery is connected to Arduino for providing power supply.

2. Related Works
In existing technique, it describes the gas leakage monitoring system. It detects the level of gas in air and checks whether it exceeds the safe value. It activates the audio-visual alarm and a buzzer to alert the user at the time of leakage. This system alerts only the resident.

Chances of fire accidents are more when the resident is not in the home due to certain reasons. If the resident is not in the home at particular time of leakage then there is no use of giving alert. In this system, the user only gets the message about the leakage and it fails to attempt automatic turn off of the valve.

In another technique, it uses AT89s52 which has a complex structure and can only perform limited number of tasks at a time. This method gives no solution for the condition when the user is not in the kitchen.

3. Methodology
At normal condition, there will be no leakage and the output of all the three sensors will be zero. When a leakage occurs, MQ-2 sensor detects leakage and sends signal to the Arduino which turns off the gas valve. At certain condition when the temperature increases beyond the critical point theLM-35 sensor detects it and sends the signal to the Arduino. In some other cases, the user may not be present in the kitchen due to various reasons. At this time, the presence of human is monitored by PIR sensor. It sends signal when no human is detected. After receiving proper signals, the Arduino decides whether to off the valve or keep it turned on.
The above figure represents the block diagram of the proposed system. In this technique, Arduino is connected with gas sensor, temperature sensor, PIR sensor, buzzer and relay. MQ-2 sensor is a gas sensor (MQ-2) and it is used to detect the leakage if occurs. Then along with that a temperature sensor (LM-35) is also utilized. This is used to monitor the ambient temperature.

The PIR sensor detects the presence of human near the kitchen and the valve is turned off when no human is detected inside the kitchen over a long time. This will be highly reliable.

4. Power supply circuit
The Arduino needs a power supply of 5V. When there is no power supply in the home, power must be supplied to Arduino constantly. Hence a battery is used for providing uninterrupted power supply.

The above figure represents the power supply circuit. The Arduino is operated at 5V and it has a power cable.
5. Conclusion
In today’s world, every home is provided with individual LPG connection. LPG is used in cities as well as in rural areas. Due to this, the number of accidents due to LPG leakage is increasing day by day. Hence, we need a reliable and efficient technique to overcome this tragedy. This paper helps in bringing up a solution. Many advancements can be done in this technology.

The gas leakage detector can be implemented using tripper circuit which trip off the main supply at risk stage. When the gas valve is turned off, the power supply is also tripped to reduce risks. A robot can also be employed for monitoring the pipeline gas system. A solenoid valve is used for providing co2 supply.

Countless people were injured due to the cylinder blast. Many are died. So there is demand in attaining a secured system. This proposed method increases the safe operation of LPG system, reduces the risk, provides automated operation and increases reliability.

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