THE IMPROVEMENT OF THE SYSTEM DETECT FIRE AND GAS LEAKAGE IN WORKSHOP STORE USING GSM MODULE FOR SEND MESSAGE ALERT

W.M Dahalan[1], M.F Abdul Aziz[1], Rohaimi M.D[1], Samsol A.Z[3], A.G Othman[2], Azhar O[1]

[1]Marine Electrical & Engineering Section, Universiti Kuala Lumpur, Malaysian Institute of Marine Engineering, Technology Lumut, Perak, Malaysia.
[2]Entrepreneur Management Section, Malaysian Spanish Institute, Kulim Hi-Tech Park, 09000 Kulim, Kedah, Malaysia.

[3]Marine Engineering Section, Universiti Kuala Lumpur, Malaysian Institute of Marine Engineering, Technology Lumut, Perak, Malaysia.

Corresponding author: wardiah@unikl.edu.my

ABSTRACT

An appropriate plan of fire and gas frameworks starts with the determination of an exhibition focus for capacities utilized by the fire and gas framework. Then, the execution of a fire and gas framework is essentially portrayed by the framework's ability to distinguish dangers (indicator inclusion) and the framework's capacity to moderate risks. The objective of this research is to improve the system that detects gas as well as fire outbreaks and use gsm module to notify the user via message as soon as possible for that user can take appropriate action to control it. This system makes use of a microcontroller along with a sensing circuit that will detect gas leakage and fire with the help of an alarm system that gives alerts about fire or gas leakage. With the installation of a GSM modem, SMS are sent to notify the user if there is fire or gas leakage, and if the fire occurs, the water sprinkler sprinkles water on the affected area to reduce the effect of the fire. An MQ2 gas sensor is used to build the system, and on testing, the system gave adequate information and timely alert as SMS on detecting the gas leakage. The fire detection can also be carried out by using the temperature sensor (Waterproof DS18B20), which detects the fire in the working area and alert SMS is sent to the user. Also, an excess temperature detection system is implemented using a temperature sensor to detect the excess temperature beyond the preset value.

***Keywords**: Arduino Uno, gas sensors, temperature sensor, GSM modem, power supply*

INTRODUCTION

Gas leakages and fire outbreaks in industries and houses have led to vast destruction and losses in the past. If proper action is not taken on time, gas leakages and fire outbreaks spread widely and lead to even more significant loss of life and property. So here we propose a system that detects gas and fire outbreaks and alerts us accordingly so that users can take proper action to control them. [1]. In this research, mainly three units are used in the proposed system: sensor unit, microcontroller unit, and GSM modem. A flame sensor unit (LM35 temperature detector) has been placed for quick and efficient fire detection. This unit can easily be incorporated into a buzzer unit to sound an alarm. GSM modem can be configured by standard GSM AT command set for sending and receiving SMS and getting modem status. Depending upon the gas sensor output, the microcontroller can send a message to the authorized person.

Proposed System Architecture

The system shows the fire and gas detection system. The system mainly consists of a fire and gas leakage detection system, a microcontroller with a GSM module, and protection circuitry. The system's hardware comprises a sensor section, control unit, network module, and power supply. Initially, the microcontroller sends the signal to the GSM module, and if the GSM module is appropriately connected with the microcontroller, it sends an acknowledgment signal back to the microcontroller. Then if there is any gas leakage in the atmosphere, it is detected by the gas sensor unit using MQ2 sensors. After the sensor unit detects the gas leakage, a signal is sent to the ADC unit of the microcontroller, which then sends an activation signal to other external devices connected to it, such as a buzzer, GSM module. and in case of fire leakage, the fire flames are detected by the temperature sensor. The GSM module gets activated, which sends a warning SMS to the user. At the end, when the gas or fire leakage is successfully stopped, then with the help of the reset button, the whole system is made to reach its initial stage. The MQ2 Gas Sensors detect gas leakage by comparing the concentration of ethanol in the LPG. It then gives analog voltage as output [5]. The alert message can be sent to distant remote locations using various wireless networks. GSM module requires a subscriber identification module (SIM) card from a wireless carrier to operate. In this present work, a SIM800L GSM kit has been used.

Proposed Software Design

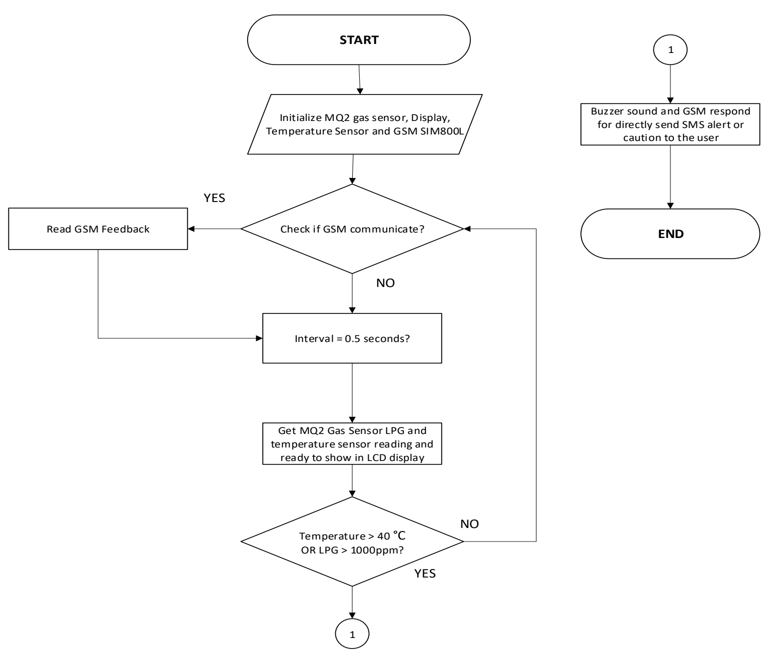


Figure 1: Flowchart of the proposed system

Figure 1 shows the program flowchart. It includes the developed algorithm for the system. Separate programs are written for different interfacing devices such as gas sensors, temperature sensors. Finally, this system is tested by using the hardware after turning power in the microcontroller unit is initialized. Then the system searches for the network when the network is ready and gets the destination number from the system. The sensor data (Gas and Temperature) is read by the sensor data line. If the sensor data line status logic is high, the system activates the siren, and the buzzer is on. The network unit power is switched on, and SMS is sent to the respective SIM subscriber.

ANALYSIS OF THE RESULTS

The implementation circuit of the proposed system is shown in Figure 2. The proposed system is implemented in two way of methods which are Gas leakage detection testing using gas sensors (MQ2) and Temperature detection using temperature sensor (LM35).

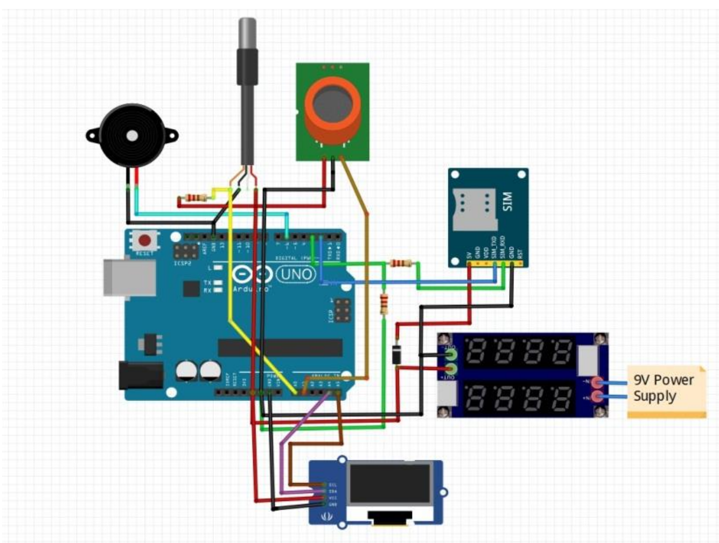
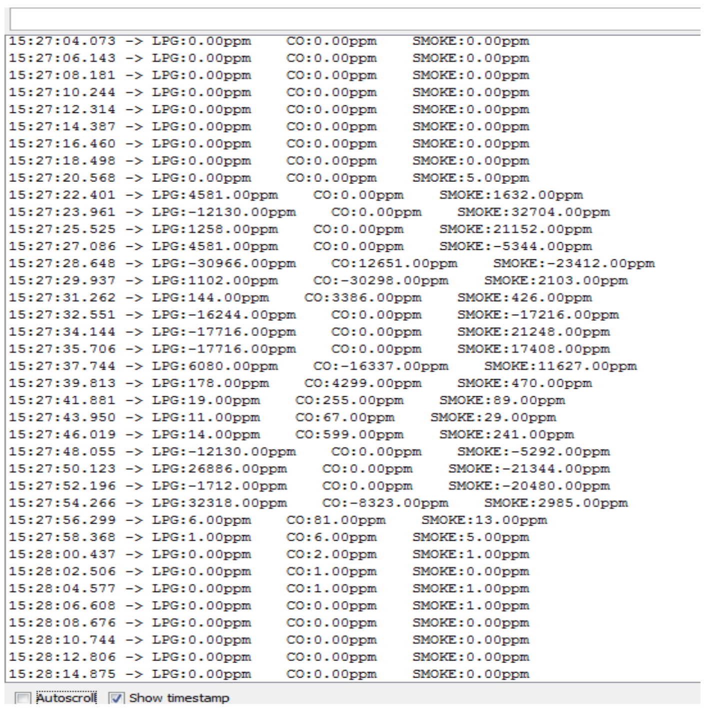


Figure 2: Circuit diagram of the system

4.1 Gas leakage detection testing using gas sensors (MQ2-LPG)

In this experiment, LPG gas are used for leakage detection. Both the gas leakage is detected by keeping gas pressure in various modes of parts per million (ppm). In Figure 4, distance between the sensors and the gas cylinders is kept as 4cm and the ppm value of gas sensor is set as 300. According to the experiments the average time taken by the system to indicate the alarm is approximate every sec.

Figure 3: Gas leakage detected by gas sensor



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15:27:04.073 -> LPG:0.00ppm    CO:0.00ppm    SMOKE:0.00ppm
15:27:06.143 -> LPG:0.00ppm    CO:0.00ppm    SMOKE:0.00ppm
15:27:08.181 -> LPG:0.00ppm    CO:0.00ppm    SMOKE:0.00ppm
15:27:10.244 -> LPG:0.00ppm    CO:0.00ppm    SMOKE:0.00ppm
15:27:12.314 -> LPG:0.00ppm    CO:0.00ppm    SMOKE:0.00ppm
15:27:14.387 -> LPG:0.00ppm    CO:0.00ppm    SMOKE:0.00ppm
15:27:16.460 -> LPG:0.00ppm    CO:0.00ppm    SMOKE:0.00ppm
15:27:18.498 -> LPG:0.00ppm    CO:0.00ppm    SMOKE:0.00ppm
15:27:20.568 -> LPG:0.00ppm    CO:0.00ppm    SMOKE:5.00ppm
15:27:22.401 -> LPG:4581.00ppm    CO:0.00ppm    SMOKE:1632.00ppm
15:27:23.961 -> LPG:-12130.00ppm    CO:0.00ppm    SMOKE:32704.00ppm
15:27:25.525 -> LPG:1258.00ppm    CO:0.00ppm    SMOKE:21152.00ppm
15:27:27.086 -> LPG:4581.00ppm    CO:0.00ppm    SMOKE:-5344.00ppm
15:27:28.648 -> LPG:-30966.00ppm    CO:12651.00ppm    SMOKE:-23412.00ppm
15:27:29.937 -> LPG:1102.00ppm    CO:-30298.00ppm    SMOKE:2103.00ppm
15:27:31.262 -> LPG:144.00ppm    CO:3386.00ppm    SMOKE:426.00ppm
15:27:32.551 -> LPG:-16244.00ppm    CO:0.00ppm    SMOKE:-17216.00ppm
15:27:34.144 -> LPG:-17716.00ppm    CO:0.00ppm    SMOKE:21248.00ppm
15:27:35.706 -> LPG:-17716.00ppm    CO:0.00ppm    SMOKE:17408.00ppm
15:27:37.744 -> LPG:6080.00ppm    CO:-16337.00ppm    SMOKE:11627.00ppm
15:27:39.813 -> LPG:178.00ppm    CO:4299.00ppm    SMOKE:470.00ppm
15:27:41.881 -> LPG:19.00ppm    CO:255.00ppm    SMOKE:89.00ppm
15:27:43.950 -> LPG:11.00ppm    CO:67.00ppm    SMOKE:29.00ppm
15:27:46.019 -> LPG:14.00ppm    CO:599.00ppm    SMOKE:241.00ppm
15:27:48.055 -> LPG:-12130.00ppm    CO:0.00ppm    SMOKE:-5292.00ppm
15:27:50.123 -> LPG:26886.00ppm    CO:0.00ppm    SMOKE:-21344.00ppm
15:27:52.196 -> LPG:-1712.00ppm    CO:0.00ppm    SMOKE:-20480.00ppm
15:27:54.266 -> LPG:32318.00ppm    CO:-8323.00ppm    SMOKE:2985.00ppm
15:27:56.299 -> LPG:6.00ppm    CO:81.00ppm    SMOKE:13.00ppm
15:27:58.368 -> LPG:1.00ppm    CO:6.00ppm    SMOKE:5.00ppm
15:28:00.437 -> LPG:0.00ppm    CO:2.00ppm    SMOKE:1.00ppm
15:28:02.506 -> LPG:0.00ppm    CO:1.00ppm    SMOKE:0.00ppm
15:28:04.577 -> LPG:0.00ppm    CO:1.00ppm    SMOKE:1.00ppm
15:28:06.608 -> LPG:0.00ppm    CO:0.00ppm    SMOKE:1.00ppm
15:28:08.676 -> LPG:0.00ppm    CO:0.00ppm    SMOKE:0.00ppm
15:28:10.744 -> LPG:0.00ppm    CO:0.00ppm    SMOKE:0.00ppm
15:28:12.806 -> LPG:0.00ppm    CO:0.00ppm    SMOKE:0.00ppm
15:28:14.875 -> LPG:0.00ppm    CO:0.00ppm    SMOKE:0.00ppm
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Autoscroll Show timestamp

Figure 4: Readings of gas sensor for LPG

Table 1: Readings of gas sensor for LPG

Distance (cm)	Time taken (sec)	Sensor Output (PPM)	Result
1.0	5	17684	LPG>300ppm (Alert)
2.0	5	8576	LPG>300ppm (Alert)
3.0	5	4447	LPG>300ppm

			(Alert)
4.0	5	2496	LPG>300ppm (Alert)
5.0	5	1640	LPG>300ppm (Alert)
6.0	5	797	LPG>300ppm (Alert)
7.0	5	331	LPG>300ppm (Alert)

According to the experiments, the average time taken by the system to indicate the alarm is approximate 0.5 until 5 sec. If LPG gas is introduced near the sensor, it detected by the gas sensor. After initializing the gas leakage detection, the microcontroller sends command to operate the GSM modem. The GSM modem will now send message to the registered mobile number of the user that is predefined by the programmer.

4.2 Fire detection testing using flame sensor (IR)

In this experiment to observe the performance and response of the system to the various fire situations and various tests were performed with varying the flame. The sensor senses the fire intensity and feds the signal to the microcontroller which commands the GSM to send the message to the user about the fire alert in the working area.

Figure 5: The fire is detected by the sensor.

4.3 Temperature and LPG detection using temperature sensor (DS18B20)

To observe the temperature, increase in the enclosed surrounding, heater is on higher temperature in the car and observe the temperature sensor output on LCD display. Readings taken from varying distance. The constant temperature is set as 40 °C.

Figure 6: When both of sensor detect fire and gas leakage

Table 2 Testing results of the temperature sensor output readings (distance= 1.0 – 7.0 cm)

Distance (cm)	Time taken (sec)	Sensor Output(°C)	Result
1.0	5	81.37	Temp>40°c (Alert)
2.0	5	68.94	Temp>40°c (Alert)
3.0	5	54.19	Temp>40°c (Alert)
4.0	5	45.69	Temp>40°c (Alert)
5.0	5	38.12	Temp<40°c (No Alert)
6.0	5	35.44	Temp<40°c (No Alert)
7.0	5	33.94	Temp<40°c (No Alert)

4.4 SMS notification via GSM after detecting leakage

Whenever the GSM modem gets the command message, "Alert" from the microcontroller, it will send the message to the mobile number which is stored in the microcontroller. The message is sent to the registered mobile number within 2 until 4 seconds. This alarms the user that there is leakage in the particular area. The messages that are displayed in LCD as shown in figures below:

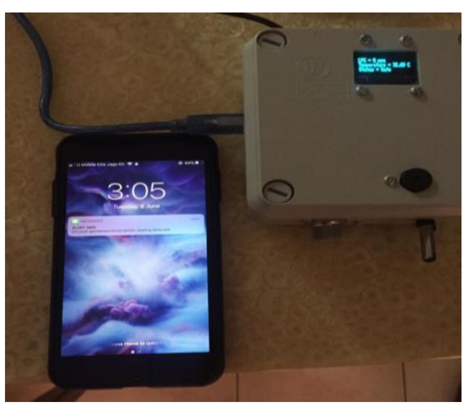

Figure 7: When GSM modem is connecting

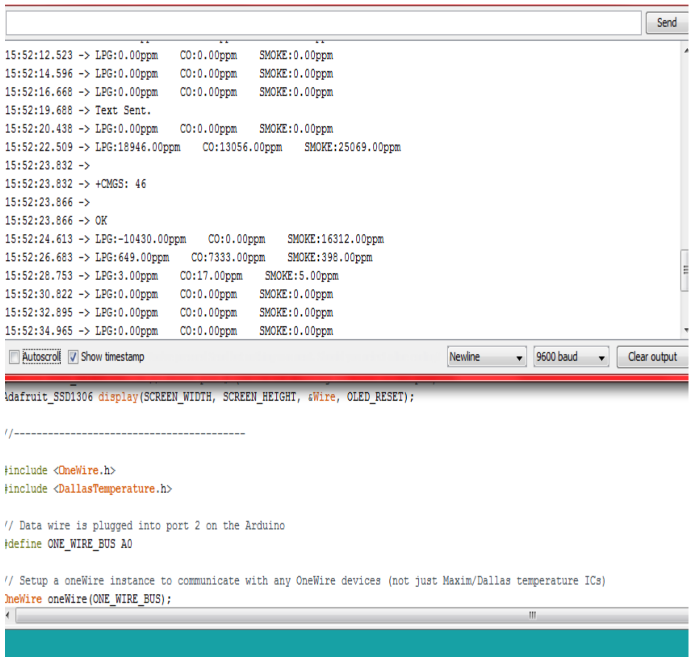

Figure 8: Value reading LPG showed in the command Arduino

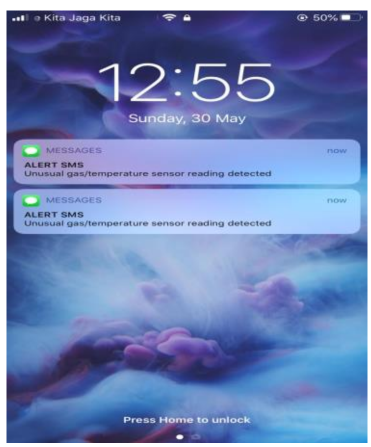

Figure 9: SMS is sent to the user

CONCLUSION

This research is an attempt to provide store workshop safety systems. The system is tested for various sensor for detecting gas (LPG), excess temperature (DS18B20) and flame detection (IR sensor). Accordingly, it is noted that average time required to detect LPG leakage. The system also works effectively and gives alert for excess temperature detection above 40°C for any change in condition. SMS have been effectively sent to the authority and comply with the objective of this research.

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