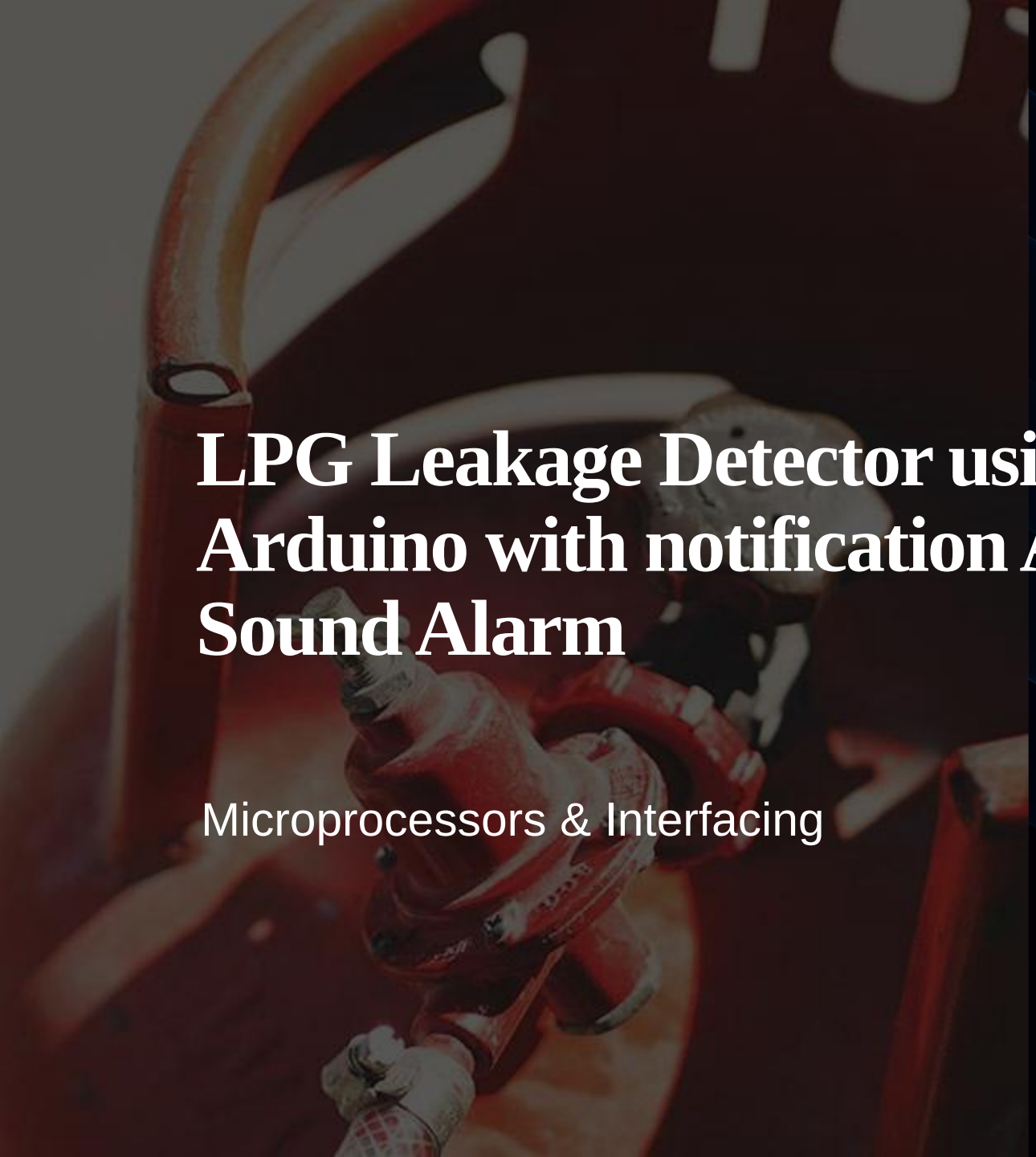
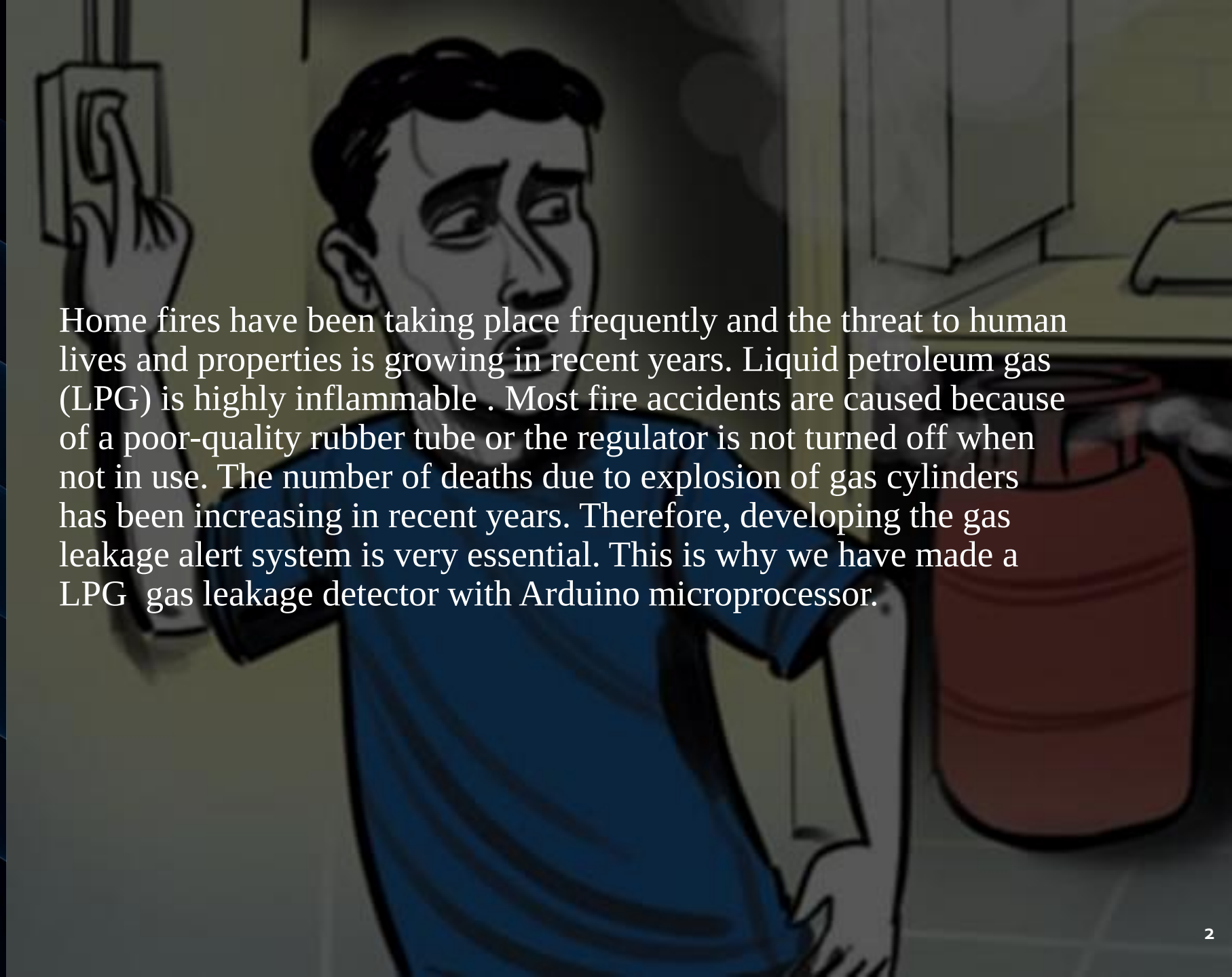


LPG Leakage Detector using Arduino with notification Alert and Sound Alarm

Microprocessors & Interfacing

Introduction



Home fires have been taking place frequently and the threat to human lives and properties is growing in recent years. Liquid petroleum gas (LPG) is highly inflammable . Most fire accidents are caused because of a poor-quality rubber tube or the regulator is not turned off when not in use. The number of deaths due to explosion of gas cylinders has been increasing in recent years. Therefore, developing the gas leakage alert system is very essential. This is why we have made a LPG gas leakage detector with Arduino microprocessor.

Objective

- Detect Gas Leakage (like LPG) using MQ6 Sensor and Arduino
- Setup a notification based Alert Mechanism using nodeMcu device.
- Sound Alarm – produce sound alert on gas leak
- Display status in an LCD using a 16×2 LCD module.

Background Study

- Leakage of LPG can be dangerous as it raises the risk of building fire, suffocation or an explosion.
- For every 20L volume of air, 2% to 10% of LPG in air is enough to cause an explosion.
- The Chiba Oil Refinery fire incident in japan on 11th March, 2011 which caused six injuries and destroyed all 17 LPG tanks comes to mind.
- In such a case, a gas leakage detector becomes vital and helps to protect people from the dangers of gas leakage.
- Thus, our project is aimed at designing and building a wireless LPG leakage detector.

Previous Researches

There are many previous researchers on the same project that we have done. We had taken ideas from some of them. Here I have given some of the research's link so that we can compare our project with them.

Other Projects and link on "LPG leakage detector":

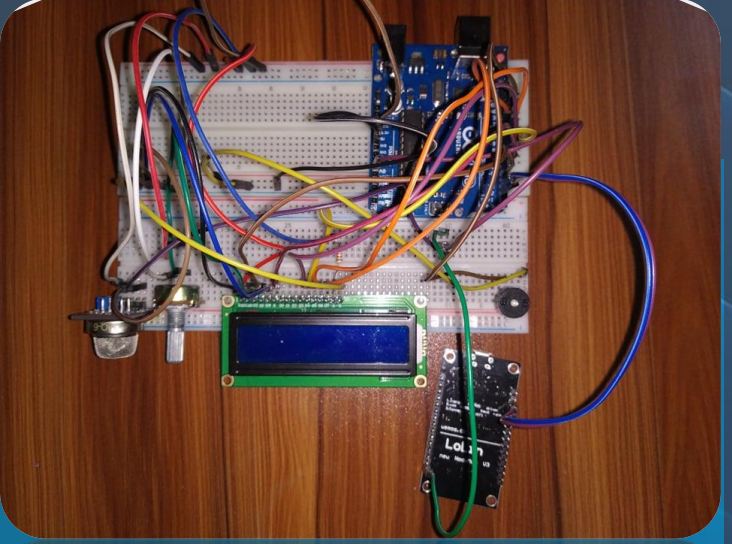
1. Project of Rasika Joshi (EEE Engineer, India)-https://maker.pro/arduino/projects/lpg-gas-leakage-detector-using-Arduino
2. Project of Mr. Alam (Engineer, Bangladesh)-https://how2electronics.com/gas-leakage-detector-gsm-arduino-sms-alert/#comments
3. Project of Circuits today-https://www.circuitstoday.com/gas-leakage-detector-using-arduino-with-sms-alert
4. Project of hIOTron IOT-https://www.instructables.com/LPG-Gas-Leakage-Detector-Using-Arduino/
5. Project of neven Projects-https://nevonprojects.com/iot-based-intelligent-gas-leakage-detector-using-arduino

Comparison of our Project with others Projects

Equipment	To send sms we used Nodemcu Esp8266 and to detect gas we used MQ6 gas sensor. To connect the buzzer we did not use any transistor.	To send sms they used SIM900 GSM module and to detect gas they used MQ5 gas sensor. To connect the buzzer they used a transistor.	To send sms they used SIM800 GSM module and to detect gas they used MQ5 gas sensor. They also used a DC fan to exhaust the gas automatically.
Notification system	We have not limited the number of SMS alerts. When the gas leakage occurs the system will send SMS in every 30 seconds.	They have limited the number of SMS alerts. When the gas leakage occurs the system will send SMS only once .	They also have limited the number of SMS alerts. When the gas leakage occurs the system will send SMS 3 time .
Software	To connect the Nodemcu with user's device we used Blynk app and for simulation we used	As they used GSM module they didn't need to use Blynk app and they didn't simulate the circuit	As they used GSM module they didn't need to use Blynk app and they didn't simulate the circuit

Comparison of our Project with others Projects

Properties	Our Project	Project of Circuits Today	Project of neven Projects
Equipment	We did this project using Arduino Uno and 16*2 LCD display. To control the brightness of the display we used a 100k pot and to give warning signal we also used a buzzer.	They did the project using Arduino Uno and 16*2 LCD display. To control the brightness of the display they used a 100k pot and to give warning signal they also used a buzzer.	They also did the project using Arduino Uno and 16*2 LCD display. To control the brightness of the display they used a 100k pot and to give warning signal they also used a buzzer.
Working of the Project	When the LPG sensor senses any gas leakage from storage the output of this sensor goes low. This low signal is monitored by the microcontroller and sends the signal to Nodemcu to send message to the mobile number written in code.	In this project the working of the system is almost same as ours project. It just send the received signal from the microcontroller to GSM module.	Whenever the gas exceeds above the predefined limit than the RGB LED will glow red and simultaneously solenoid value will turn off and update it over IOT and the DC fan will turn on automatically.
Code	To connect the Arduino Uno with the system we used Arduino IDE software. The codes of the three projects are almost same.	To connect the Arduino Uno with the system they also used Arduino IDE software. The codes of the three projects are almost same	To connect the Arduino Uno with the system they used Arduino IDE software. But in this project there is a little bit difference in code because of the DC fan.



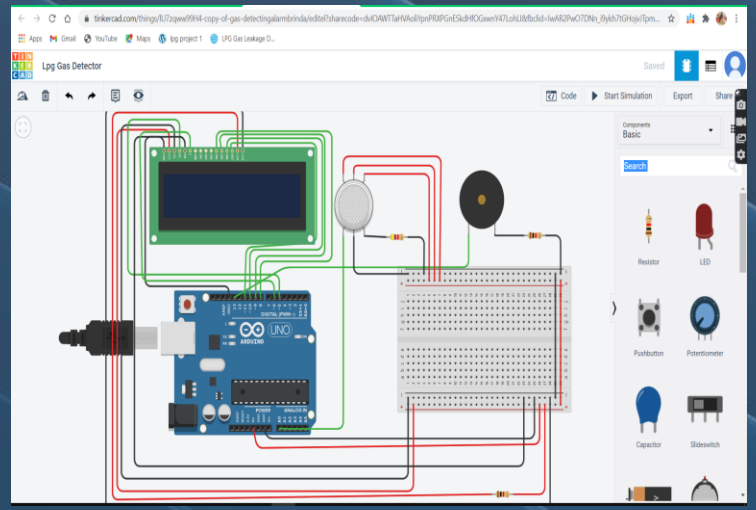
Working Principle

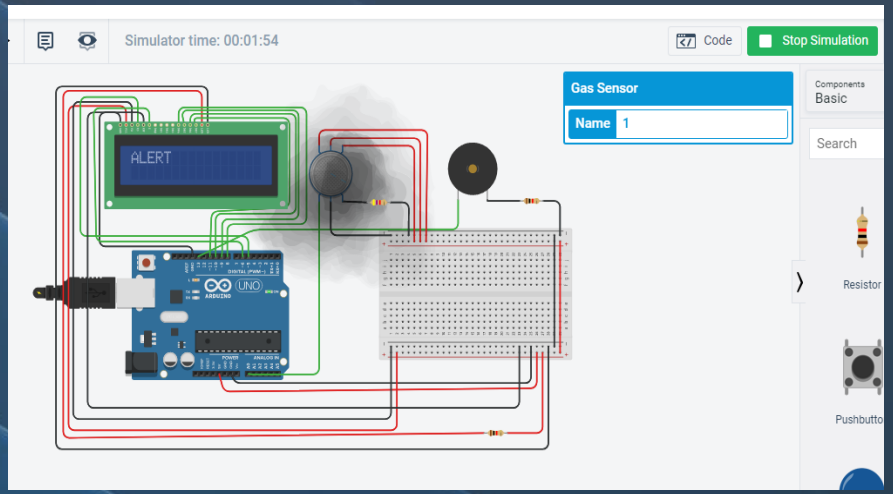
Here,mq-6 gas sensor's Ao pin is connected with arduino's Ao pin. The sensor sense the gas and send the data to arduino

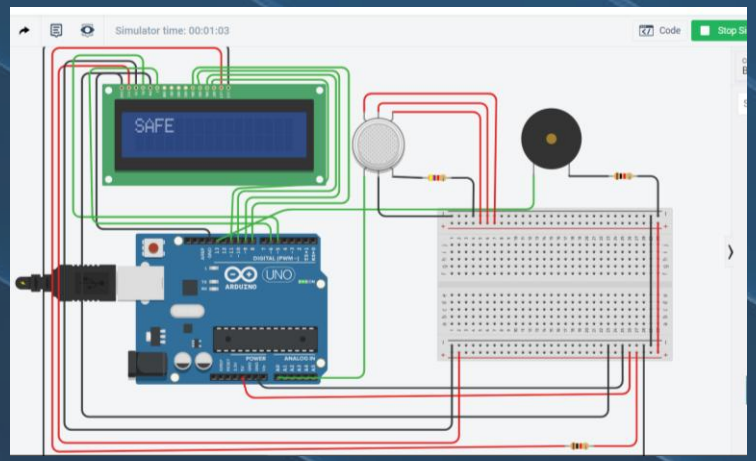
Ardunio check if the sensor value exceed the threshold voltage. When is exceed the value the arduino display a alert message on 16x2 lcd display along with it set the buzzer value high to start alarm. Simultaneously it sends a signal to nodemcu through Ao pin.

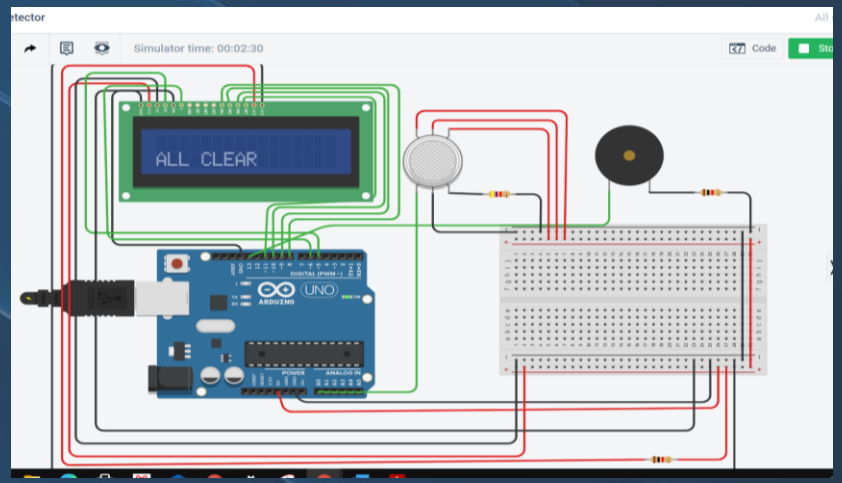
The nodemcu send the data to blynk server. From the server the message send to mobile and it shows the alert message .

Tinkercad simulation

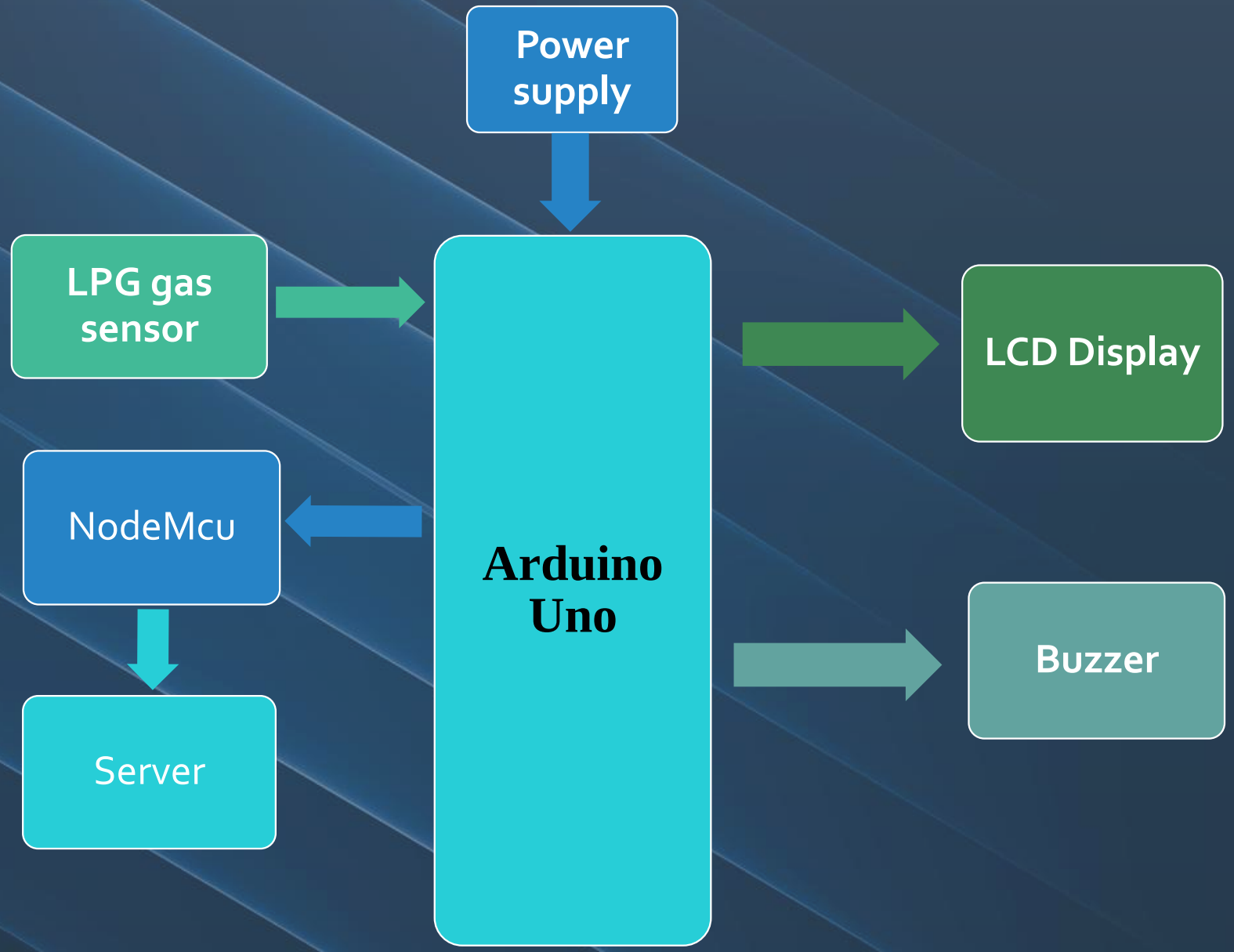








Block Diagram of communication system



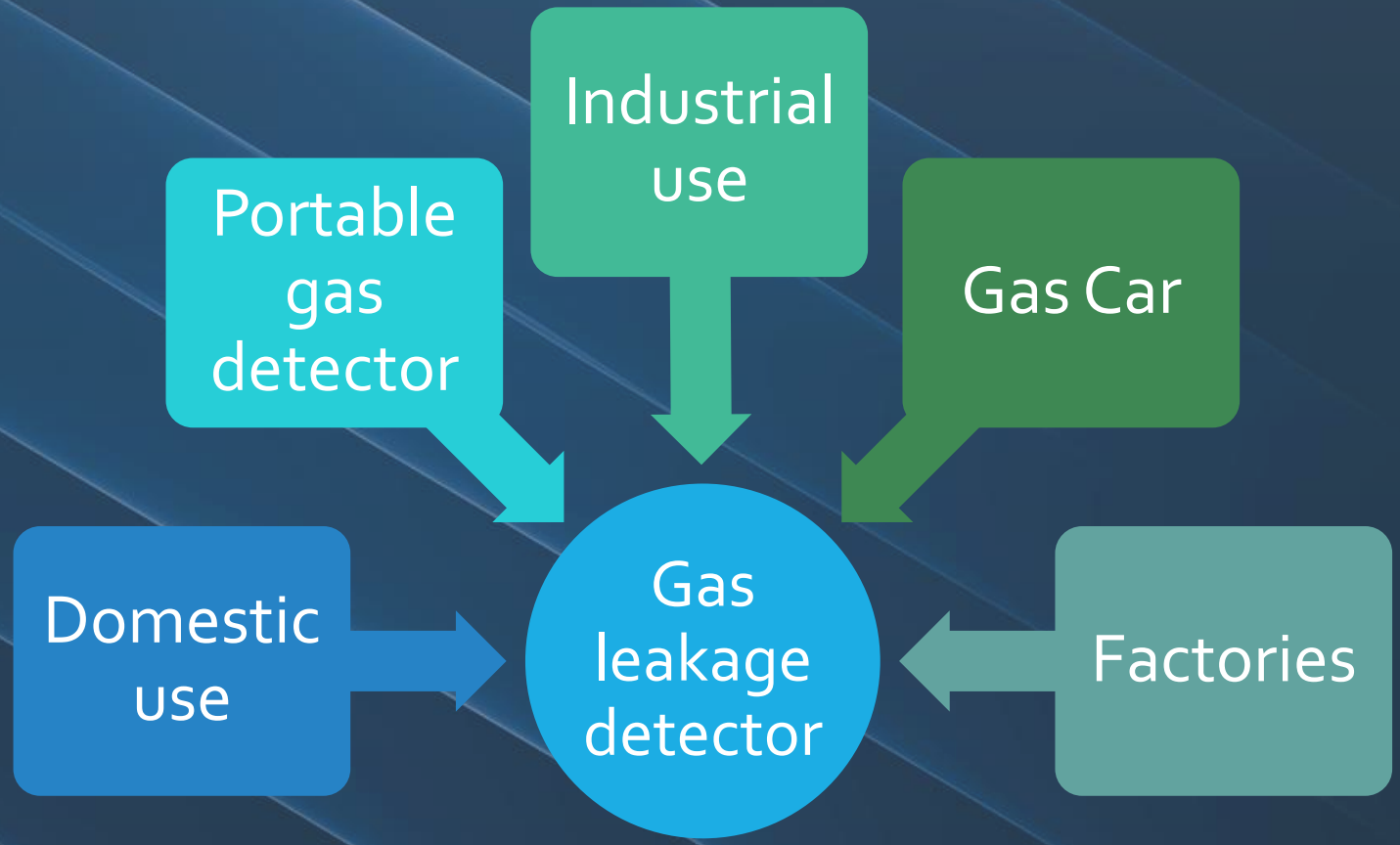
Equipment Details & cost Analysis

Equipment Name	Description	Quantity	Cost
Arduino Uno	Arduino UNO R3 Development Board	1	400 taka
Nodemcu	Esp8266 nodemcu module	1	420 taka
Buzzer	Piezoelectric Buzzer	1	10 taka
Gas Sensor	MQ6 gas sensor	1	130 taka
16*2 LCD display	JHD162A 16x2 LCD Display	1	190 taka
Breadboard	-	2	80 taka
Pot	100k	1	10 taka
Connecting Wires	Jumper Wires	20	25 taka
		Total	= 1,265 taka

Note: We bought our equipment from local market to make the project cost effective.

Application

This LPG gas leakage detector device is a vital security system device and That is why the application of this can be found in many surprising places where there is a possibility of fire hazard.



Advantages & Disadvantages

Advantages

- The sensor has excellent sensitivity combined with a quick fast response time.
- The system has no environmental effect.
- Cost efficient
- Less complex circuit.
- It is possible to get instantaneous results .

Disadvantages

- It works only when at 5V power supply is given.
- Its sensitivity depends on Humidity and temperature.
- Cannot be considered as a universal replacement and thermal detectors.

Future scope

- Other gas detection system can also be implemented.
- More secure system like a call to the user's phone.
- Can be used Bluetooth in place of nodeMcu.
- Temperature sensor can be used to detect high pressure gas.
- For industrial purposes mobile robot can be developed for detecting multiple gas concentrations.

Conclusion

The project presents a low-cost, low power and simple system. This monitoring and detection system is proposed mainly to meet the safety standards and to avoid fire accidents because of leakage. Here only two gases (LPG and Bueteane) have been detected for demo purpose. This system will have high application in industries and houses where it has been a bigger challenge for safety measures. Future modification may include addition of micro controller and GSM module for concentration detection and SMS system and our project will prove to be boom for households and industries.

By doing this project we have learnt a lot about Arduino microprocessor which has been very helpful for our course and also we can apply this knowledge and skills in future to our professional life.

THANK YOU