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KORINT
YAYINCILIK

SMART GAS AND SMOKE DETECTOR

NUR ALYA BATRISYIA BINTI MOKTAR LOTFI

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ABSTRACT

Safety plays a major role in today's world and it is necessary that good safety systems are to be implemented in places of education and work. This work modifies the existing safety model installed in industries and this system also be used in homes and business premises. One of the preventive measures to avoid the danger associated with gas leakage is to install a gas leakage detector at vulnerable locations. A gas detector is a device that detects the presence of gases in an area, often as part of a safety system. Gas Detector where it can sound an alarm to operators in the area where the leak is occurring, giving them the opportunity to fix or leave. This type of device is important because there are many gases that can be harmful to organic life, such as humans or animals. Containment into any area where the gas should not be present must be avoided. Because a small leak may gradually build up an explosive concentration of gas, leaks are very dangerous. Nowadays, existing gas detector is less effective in usage because the user can only detect the gas leakage when they test by using gas detector. It is dangerous since gas leakage must be identified from early of the leak. That is why the Smart Gas and Smoke Detector was invented to avoid the fire or explosion occur in the houses or premises. This kind of gas detector will detect the gas continuously as long as there is power supply. This project used Microcontroller Arduino UNO at the processor where it process the input from the sensor and to GSM module to communicate with the user by sending an alert through SMS. The benefit of these projects is to prevent the earlier stage of fire because of unattended cooking without a human supervision, could prevent the explosion because of gas leakage.

Keywords: gas detector, gas leakage, sms.

INTRODUCTION

LPG (Liquefied Petroleum Gas) gas cylinders are the main need for the community to meet cooking or business needs. In addition, gas tube leaks often occur which are harmful to the user community and the surrounding environment. In the event of a leak, a strong gas smell will occur. In essence, an explosion can be avoided if there is an early prevention, when the gas exits or when a gas leak occurs.[5]

We know that fire attacks due to gas leakage in buildings, restaurants, etc are increased severely. If the gas knob is left open accidentally for a few hours it only smells and does not catch fire, but it is kept open for a long time, and then if there is any ignition then the gas rapidly catches fire. The sensor in the circuit will sense the leakage, if the leakage is of high intensity it will put the alarm or the buzzer on so the owners will be alert so as to take precautions measures to minimize the possibility to catch fire or any loss to life or property. This is a robust Gas sensor suitable for sensing LPG, Smoke, Alcohol, Propane, Hydrogen, Methane and Carbon Monoxide concentrations in the air.[2]

The project entitled "Smart Gas and Smoke Detector", will be a great help in terms of preventing any danger caused by gas leakage. This project will be informed about the leakage via SMS alert.

PROBLEM STATEMENT

- The presence of gas and smoke leakage without us being aware of their existence.
- Unable to be alert the information about any source of fire or smoke leak when it occurs.
- Gas leakage can cause fire that will lead to serious injury or death and it also can destroy human properties.

OBJECTIVES

- To develop a system that can detect the presence of gas and smoke leakage.
- To send information of any the cause of the fire or smoke and gas leakage into SMS so that users will be more alert.
- To develop a system that can reduce serious injury or death and it also can destroy human properties.

SCOPE OF PROJECT

This system can be implemented in residential area, small industries and restaurant. Besides that, this system also exposes to the community about the important of the smart gas and smoke detector to be used because it can help to avoid any dangers of gas leakage that not only can give effect to the user but to the other person too.

IMPORTANT OF RESEARCH

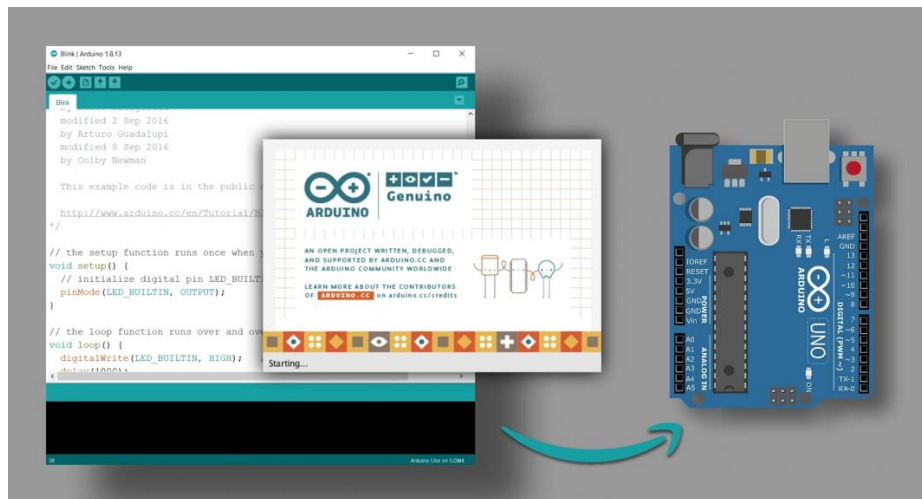
- Detect the level of dangerous gas and smoke leaks early.

- Monitoring of gas and smoke leaks via SMS alerts.

METHODOLOGY

Hardware Products that we used. It consists of Arduino IDE, Arduino UNO microcontroller, MQ-135 sensor, GSM module, LCD display and potentiometer.

Arduino IDE



The Arduino IDE is a cross-program application created in Java and is originate from IDE for the deal with a programming language and the wiring project. It is proposed to establish programming to a performer and other new users unfamiliar with software enhancement. It includes code editor with feature such us syntax importance, automatic indentation, brace matching, and is also qualified of compiling and uploading a package to the board with a specific click.[3]

Arduino



The Arduino Uno is the microcontroller chip that is responsible for all function of our proposed project. It functions as the brain of this system. The microcontroller chip used is Arduino Uno manufactured by Arduino. The chip works to control the hardware and the interface with the transmitter part.[3]

Arduino is an open-source electronics platform, based on easy-to-use hardware and software. Over the years, it has been used for thousands of projects, from everyday circuits to complex scientific instruments. The entire Arduino project has started in 2004. when a Colombian student made a “Wiring” platform for his graduate thesis. In this way a new, low cost, and simple electronic device for fast prototyping was created. Arduino programs are written using a simplified version of C++, which makes it easier to learn. Arduino boards are very versatile and can be used for a variety of different applications. Some of them are: Uno, Due, Mega, Leonardo, Micro, Esplora etc. For the purpose of gas detection system, Arduino Uno was considered quite acceptable.[1]

Arduino Uno is the most frequently used variant, since it is very beginner friendly. It consists of 14-digital I/O pins, where 6-pins could potentially be used for the Pulse Width Modulation (PWM) outputs, 6-analog inputs, a reset button, a power jack, a USB connection, In-Circuit Serial Programming (ICSP) header etc., and – ATmega328 [2]. ATmega328 is a high performance AVR microcontroller with 8-bit RISC (Reduced Instruction Set Computer) architecture. It has low power consumption and can execute 131 instructions per single clock cycle. It has 32KB ISP (In-System Programming) flash memory with readwhile-write capabilities, 2KB SRAM, 1KB EEPROM and maximum operating frequency of 20MHz.[1]

MQ-135 Sensor



MQ135 is one of the commonly used gas sensors in MQ sensor series. It is a Metal Oxide Semiconductor (MOS) type Gas Sensor also known as Chemiresistors as the detection is based upon change of resistance of the sensing material when the Gas comes in contact with the material. Using a simple voltage divider network, concentrations of gas can be detected. MQ135 Gas sensor works on 5V DC and draws around 800mW. It can detect LPG, Smoke, Alcohol, Propane, Hydrogen, Methane and Carbon Monoxide concentrations anywhere from 200 to 10000ppm.[2]

If the gas and smoke exceed the level of 500 and above, then the signal will be sent to SMS to inform that the level is in danger. with a gas content above 200 PPM.

Smoke detectors are very much needed, since they can help in reducing the number of fires or at least decrease the damage done. Having any smoke detector is better than having none. Best smoke detectors can detect smoke particles, flames and carbon monoxide. Smart smoke detectors represent a cutting-edge technology for fire safety, since they can communicate through the apps and deliver alerts to a phone or some other device or system.[9]

Smoke detectors should always have a backup power source for the case of power loss. There are two basic types of passive smoke detectors: photoelectric and ionization. Combination of these makes a dual sensor smoke alarm, which is recommended for maximum protection from both fast flaming and slower fires. Photoelectric alarms use light to detect smoke. They sense sudden scattering of light when smoke enters into the detectors chamber, which further triggers the alarm. This method of detection can detect fires that begin with long duration of smoldering aptly.[1]

GSM Module



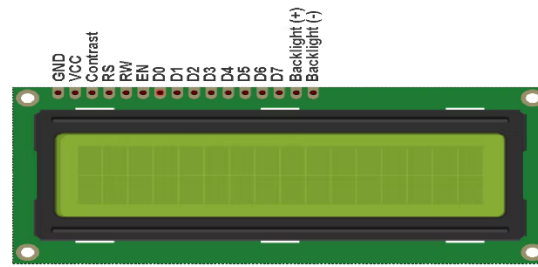
A GSM modem or GSM module is a hardware tool that uses GSM telephony technology to provide a data connection to a remote network. From a mobile phone network view, they look exactly like a normal cell phone, including the need for a SIM card identification on the network. GSM modems typically provide virtual TTL connectors at their commander level. They are often used as part of an embedded system.[11]

SIM900A Modem is built with Dual Band GSM/GPRS based SIM900A modem from SIMCOM. It works on frequencies 900/ 1800 MHz. SIM900A can search these two bands automatically. The frequency bands can also be set by AT Commands. The baud rate is configurable from 1200-115200 through AT command. The GSM/GPRS Modem is having internal TCP/IP stack to enable you to connect with internet via GPRS. SIM900A is an ultra-compact and reliable wireless module. This is a complete GSM/GPRS module in a SMT type and designed with a very powerful single-chip processor integrating AMR926EJ-S core, allowing you to benefit from small dimensions and cost-effective solutions.[10]

Specification:

- Dual-Band 900/ 1800 MHz
- GPRS multi-slot class 10/8GPRS mobile station class B
- Compliant to GSM phase 2/2+
- Dimensions: 24*24*3 mm
- Weight: 3.4g
- Control via AT commands (GSM 07.07 ,07.05 and SIMCOM enhanced AT Commands)
- Supply voltage range: 5V
- Low power consumption: 1.5mA (sleep mode)
- Operation temperature: -40°C to +85 °

LCD display



When the circuit is powered on after uploading code, the LCD displays the Gas Level in some analog numbers. It will display the status of whether the gas level is normal or excessive. When the gas level exceeds it will display SMS Sent status.[10]

Liquid crystal display (LCD) are available to display arbitrary images (as in a general-purpose computer display) or fixed images with low information content, which can be displayed or hidden. For instance: preset words, digits, and seven-segment displays, as in a digital clock, are all good examples of devices with these displays.

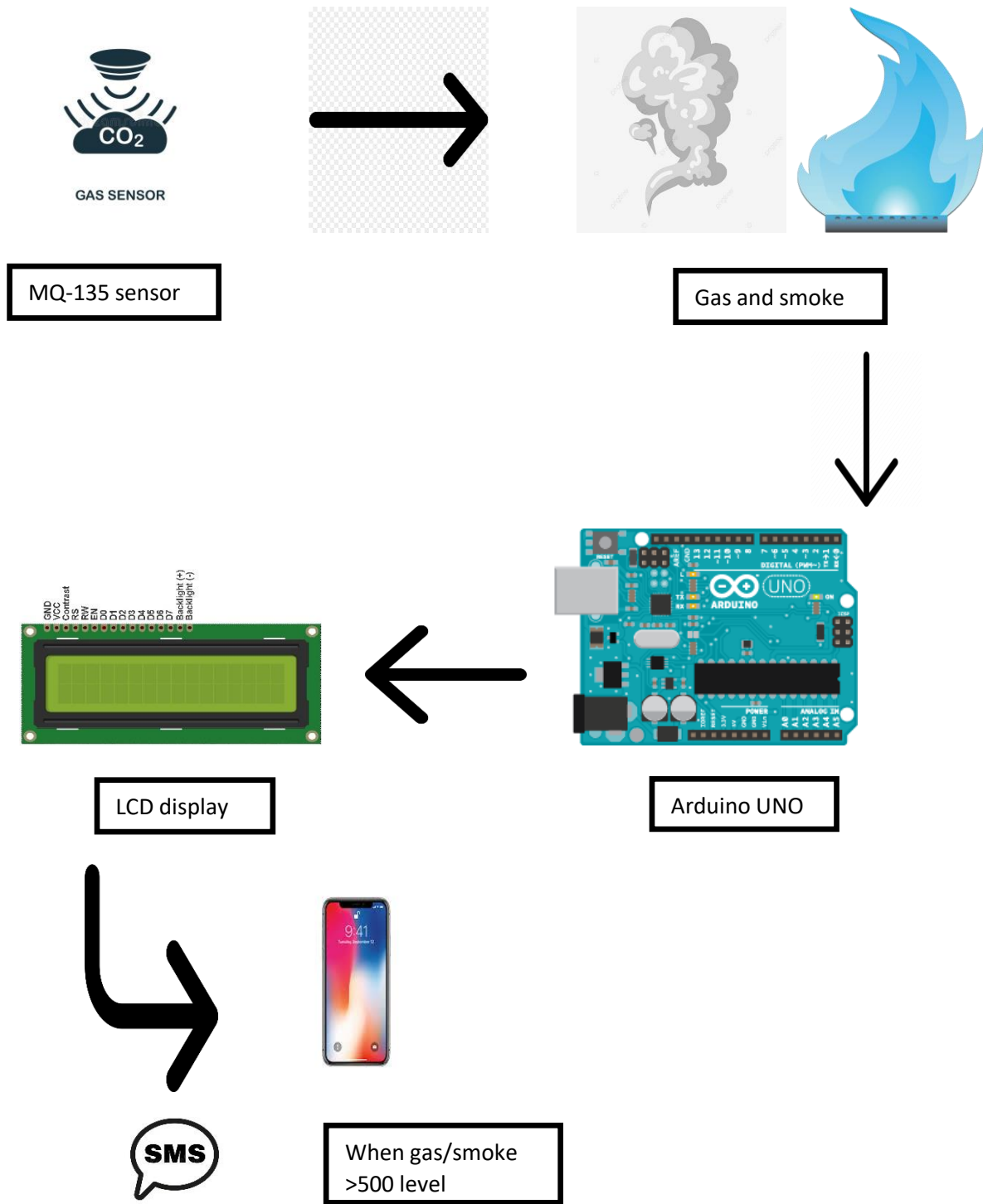
Potentiometer



A potentiometer is a three-terminal resistor with a sliding or rotating contact that forms an adjustable voltage divider. If only two terminals are used, one end and the wiper, it acts as a variable resistor or rheostat. The potentiometer is a resistor whose value for the resistance can be changed by turning its knob and is also known as variable resistor. This generic potentiometer normally has three pins; the pin in the middle is the output of the resistor whereas the other two pins can be used for giving supply and grounding the resistor.

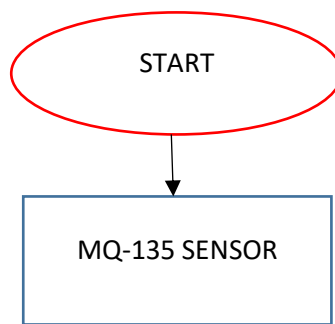
The potentiometer is also an input device of Arduino that can be used for various purposes like controlling the brightness of LED or LCD by increasing or decreasing its resistance. In this write-up a potentiometer is interfaced with Arduino and its values are displayed on the LCD.

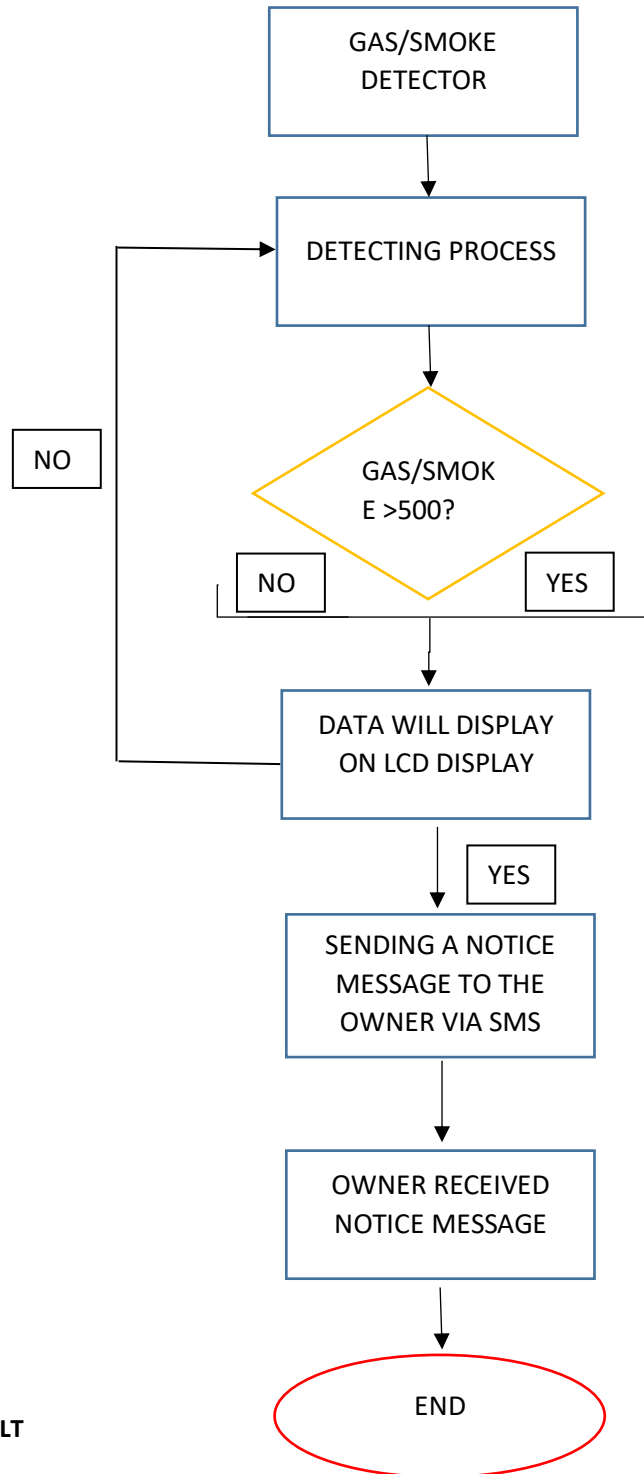
BLOCK DIAGRAM



FLOWCHART

The flow diagram of methodology that has been used in this project is shown below. It consists of the MQ-135 sensor will detect gas and smoke leakage and send to SMS a signal that the gas and smoke leaks are at dangerous levels. If the gas and smoke exceed the level of 500 and above, then the signal will be sent to SMS to inform them that the level is in danger and display it on the LCD display too.

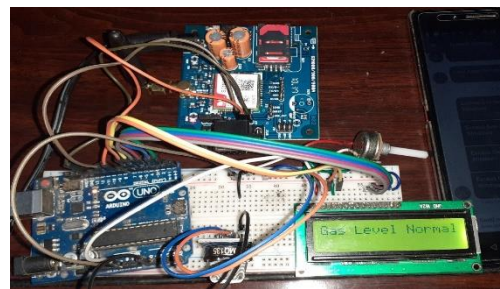
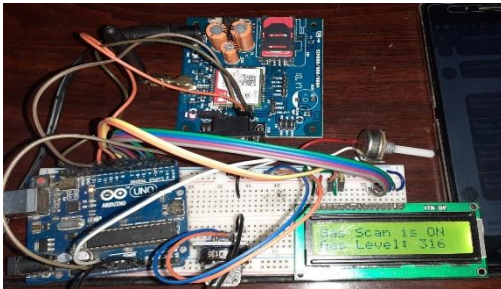


**EXPECTED RESULT**

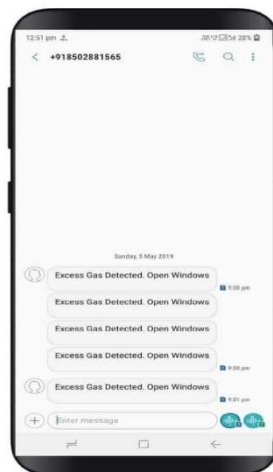
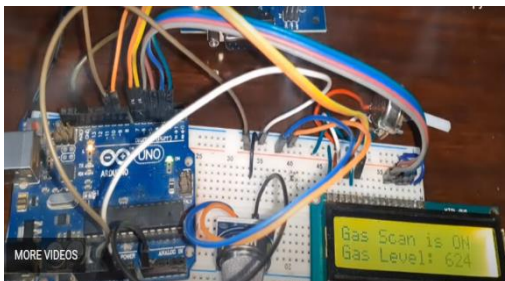
When the MQ-135 gas sensor detects smoke or gas, the LCD display will display the gas or smoke level and tell whether the gas is normal or dangerous. The SMS will send a signal that the gas and smoke leaks are at dangerous

levels, if the gas and smoke exceed the level of 500 and above, then the signal will be sent to SMS to inform that the level is in danger and display it on the LCD display too.

When the level of gas/smoke is normal:



When gas/smoke exceeds the level of 500 and above:



CONCLUSION

In this paper one possible solution for realization of detector system for recognizing presence of smoke or combustible gases is presented. System is tested in home conditions with exposing MQ-135 sensor to different

types of gases. Output sensor voltage is monitored for smoke generated by burning papers and cigarettes and for available combustible gases as butane from lighter, stove LPG and alcohol vapors. Experiments prove high sensitivity of MQ-135 sensor making it a good choice in detector system basic sensor selection. By combining with other types of sensors, it is possible to create more complex detectors.

Thus, the conclusion is that we can be aware of any danger that can be caused by gas leakage and further catching fire and causing more damage and danger. Its SMS technique can also be used with GSM technology to send messages to emergency services. We can also use it to detect various other gases other than LPG and CNG. Therefore, the "Smart Gas and Smoke Detector" will help a lot in terms of preventing any danger caused by gas leakage and useful as part of safety to avoid the gas leak that can cause harmful result.

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A STUDY OF USING THERMOXYMETER ON MEASURING HUMAN BODY TEMPERATURE, HEART RATE, AND OXYGEN SATURATION USING A SINGLE DEVICE WITH MULTIPLE SENSORS

Nur Najiha Huda binti Sulaiman