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Air Quality Detection and Notification using Arduino IDE

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Abstract: ***Truck drivers typically work long hours and occasionally in highly polluted settings like mines. Accident prevention at the workplace relies heavily on the health and alertness of the driver. The cabin's air quality can sometimes get worse, which can make drivers tired. A gas detector is a piece of equipment that works as part of a safety system to tell you if there are gases in a certain area. This type of project can communicate with the control system to automatically switch off process and is used to detect gas leaks and other emissions. There are numerous gases that can be harmful to organic life, such as humans or animals, which is why this kind of device is important. Oxygen depletion and combustible, flammable, and toxic gases can be detected with gas detectors. This kind of device is used a lot in industry and can be found monitoring manufacturing processes in places like oil rigs. Gas leak detection is the process of using sensors to find gas leaks that could be dangerous. When a hazardous gas is detected, these sensors typically emit an audible alarm. Early detection of gas leaks, when they occur, is one way to cut losses caused by leaks. One of the many technologies that helps stop gas leaks from harming people even more is the mobile sensor. Another approach to overcoming losses from both material and non-material sources is the creation of mobile sensors. It is anticipated that it will eventually be overcome using a gas sensor MQ-2 as a detector before it has a wider impact. MQ-2 is chosen due to inexpensive and long lifespan. The Arduino IDE is used to implement the C language, which is used to calibrate and configure MQ-2. With a distance of about 0-10 cm between the gas sensor and the point of leakage, it is anticipated that the results will be accurate to 80 percent after the gas sensor has been configured.***
Keywords: Sensors, Arduino IDE, GSM module, GSM Network.

I. INTRODUCTION

Gas leaks are one of the problems that regularly occur in a number of industrial industries, and the presence of a gas that cannot be seen with the unaided eye causes several accidents. Gas sensors have also been installed at multiple points in some industrial sectors to anticipate this, but this has not worked because gas can spread quickly. Not only were gas particles the focus of extensive research on gas leaks, but other particles were also included in the study. There are a lot of sensors that make it easier to detect its own gas. MQ-2 is the type of sensor which is highly sensitive to flammable gases like hydrogen, propane, and LPG. In addition to its high sensitivity, MQ-2 was chosen for its low price and suitability for a variety of applications. The mobile sensor's MQ-2 sensor, which allows it to automatically detect gas leaks while moving.

We developed an integrated system that makes use of an Arduino, a wireless communication device, to promptly monitor any gas leakage in the vicinity of the Cabin in order to reduce the risk of fire and gas leakage in the cabin. Consequently, an integrated Arduino-based plant safety monitor system can register employees' attendance, provide precise real-time positioning, monitor dynamic gas concentrations, transmit data immediately, and sound a danger alarm. This project focuses on the subject of "Gas leak detection."

The quality of the air in your car's cabin can be five times worse than the air in your home or workplace, according to studies. Numerous health issues can result from air pollution in automobiles. A sign of in-car air pollution is whenever you use your car and experience headaches, nausea, or a sore throat. Cancer and immune system disorders can also result from prolonged exposure to car air. In addition, the area in which you live increases the health effects of car air pollution. Children may also occasionally become more susceptible to DNA damage as a result of car air pollution.

The emissions from interior materials, fuel leakage, exhaust fume leakage, and infiltration of polluted air from outside the vehicle are the primary causes of hazardous air pollutants in the in-cabin micro environment. The wide variety of vehicle cabin designs has resulted in a wide range of in-cabin pollutants' characteristics, concentrations, and, consequently, personal exposure levels.12 Different manufacturers created vehicles with a variety of interior spaces, ventilation settings, interior fittings, and other features.

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Therefore, the degree to which commuters are exposed to indoor vehicle pollution is determined by the variety of vehicle cabin characteristics. The public has been particularly concerned about the vehicle cabin micro environment, which is one of many environments. Despite the fact that commuters typically spend only 5.5% of their time in vehicles, the high concentrations of various interior vehicle components' emissions and exhaust fumes carried by ventilation supply air are significant sources of harmful air pollutants that could result in unhealthy human exposure.

Pollutant concentrations in the cabin can be affected by a variety of factors, including the volume of the cabin, fan speed, number of passengers, cabin filter efficiency, and vehicle speed. When the air outside the cabin is of poor quality, the cabin air quality suffers. Originally referred to as a "pollen" or "dust" filter, cabin filters were designed to remove dust and pollens from the air, regardless of their size, depending on the number of particles and their surface area, the cabin filter removes 66% and 61% of them, respectively. They also stated that the cabin filter had a filtration efficiency of 23% at medium fan speeds and 17% at high fan speeds for the most penetrating particle size of 350 nm. We anticipate that the cabin filter will remove particles at a low mass efficiency because their mass median diameter is close to the most penetrating particle size.

II. LITERATURE SURVEY

Web of Things goal planning of various ways of life simpler by utilizing changing every smaller than normal venture close by us. As a significant portion of IoT's assistance in task modification entails behavior modification, the benefits of the current safety standards. Safety is the most important aspect of IoT use. Gas leaks can be dangerous and fatal. Despite their superior precision, conventional gas leakage detection systems fail to identify some aspects of the leak that can be communicated to the public through notification. As a result, a capacity of statistics analyzing the data was presented to the concerned. Our primary objective is to provide a fuel leakage machine for an environment in which every dwelling has fuel leakage hardware for detecting the system. This will pass through hazardous air, notify the user via SMS, and send the notification.

III. PROBLEM STATEMENT

In a closed cabin, if there are any poisonous gases or smoke is present then persons who are in the cabin cannot identify until it is visible or causes some damage. So, a project should develop to identify the gas leakage inside the cabin and alert the person. The number of instruments used to detect fire and leak increases as the process industry becomes more complex. Because of this, there will be more cables connecting industrial sensors to the control station, which will result in messy wiring. The duct also gets bigger as a result of this.

Because the wiring is messy and it is difficult to identify the individual wire along the duct, troubleshooting the reduced insulation or any wire that is open is difficult. This likewise expands the task cost regarding link cost.

Most of the time, the control system must be separate from the fire and gas system. This is consistent with the fact that the control system typically has lower integrity requirements than the fire and gas system does. Emergency shut-down systems have been integrated into some gas and fire systems.

This is still a contentious issue. There is no one company that can provide all of the "best in show" products for all of the items discussed in this paper. As a result, there are typically interfaces between various suppliers. Purchasing all products from a single source can reduce interfaces, document sets, and inspections to a minimum, but doing so may result in a reduced selection of initiating devices and an increased initial purchase price. Field interfaces for manual call-points, heat detectors, and smoke detectors typically consist of two wires that can be changed by components in the control system or marshalling cabinets to accommodate a 4-20 mA interface. The system fails whenever the loop fails. At the moment, it is unknown where the employees working at the site are located. In the event of a hazardous situation, control station officers must personally inspect the workers' positions at the sites. This requires more time and effort.

IV. PROPOSED METHODOLOGY AND BLOCK DIAGRAM

The Air Quality Detector using ARDUNIO and GSM Module that has been proposed will be of great assistance in preventing gas leakage related dangers.

The finding of LPG leaks in homes and workplaces is the objective of this project. SMS alert will send messages to a specified mobile number in addition to sounding an alarm. Which is used to avoid accidents and property damage in the event that no one is present at the time of the leak. It saves money and lessens damage caused by gas leaks. This project will sense the various gases using MQ-2 sensor and alert the person through buzzer and send the SMS to the specified mobile number shown in figure 1 with working process in figure 2.

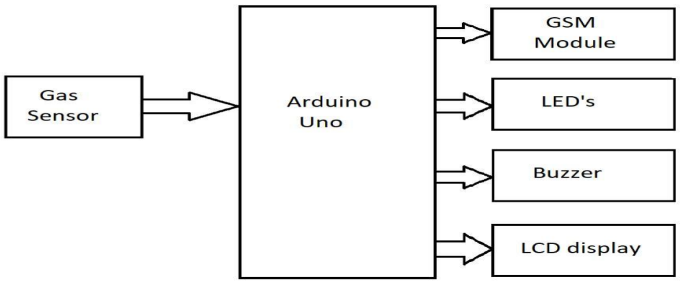


Figure 1: Block Diagram of Proposed System

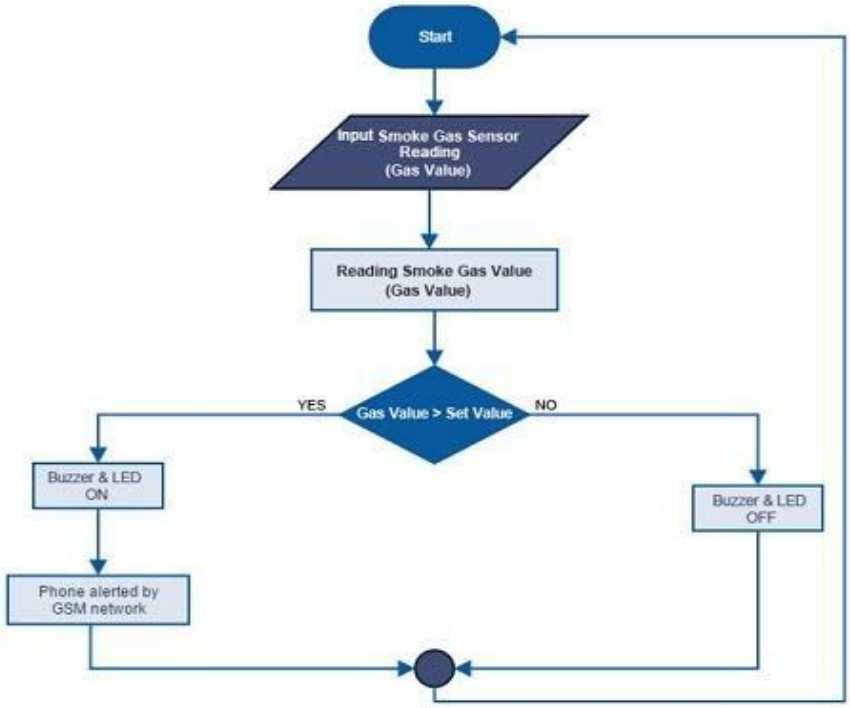


Figure 2: Flow Chart of the system

V. HARDWARE COMPONENTS AND ITS DETAILS COMPONENTS

A. MQ2 Gas Sensor

The MQ-2 sensor can detect CO, alcohol, CH_4, hydrogen, isobutene, liquefied petroleum gas, propane, and smoke among other gases. The MQ2 sensor Module comes equipped with four male headers, making it simple to connect it to the Arduino Mega or Uno via male-to-female jumper wires.



Figure 3: MQ2 Sensor

B. GSM Module

GSM is a versatile correspondence modem; GSM is the acronym for the global system for mobile communication. In 1970, Bell Laboratories developed the concept of GSM. It is broadly involved versatile correspondence framework on the planet. GSM is a digital, open cellular technology that operates in the 850MHz, 900MHz, 1800MHz, and 1900MHz frequency bands and is used to transmit mobile voice and data services. For communication purposes, the GSM system was developed as a digital system employing the time division multiple access (TDMA) technique. After reducing and digitizing the data, a GSM sends it through a channel with two distinct streams of client data, each at a distinct time. The digital system can carry data rates ranging from 64 kbps to 120 Mbps.



Figure 4: GSM Module

C. LCD Module (16×2)

LCD, or Liquid Crystal Display, is the technology used in scratch pad games and other smaller personal computers. LCDs, like gas-plasma and light-producing diode (LED) technology, enable presentations to be significantly thinner than CRT technology. Because they operate rather than emitting it in the direction of blocking light, LCDs use significantly less power than LED and gas displays.

D. Buzzer

The ringer will be utilized to discharge sounds to alarm clients during spillage. A buzzer or beeper is a type of electronic signaling device that typically consists of a number of switches or sensors connected to a control unit. These switches or sensors determine which button was pressed and for how long, as well as whether or not a predetermined amount of time has passed. They also typically illuminate a light on the appropriate button or control panel and sound a warning in the form of continuous or intermittent buzzing or beeping. This device was initially based on an electromechanical system similar to an electric bell without the metal gong.



Figure 5: Buzzer

VI. RESULTS

Whenever a gas/smoke is detected in the cabin, Buzzer will sound and led will glow red. A SMS will be sent to specified mobile number regarding cabin's air quality.

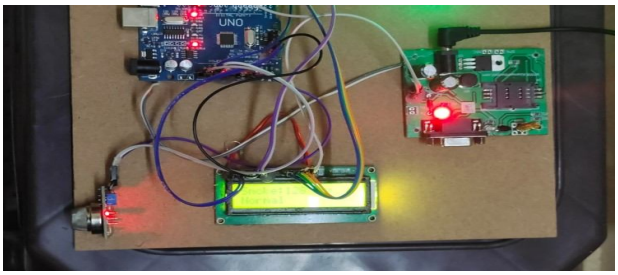


Figure 6: Demonstration of Prototype

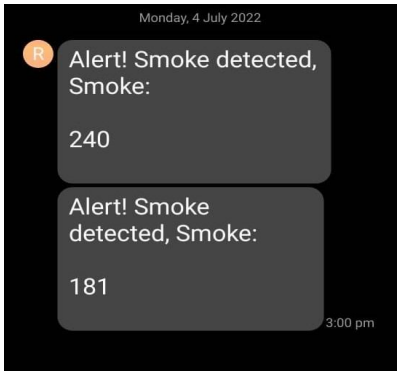


Figure 7: Alert message sent to user

Threshold Voltage is set to 180 ppm. If surrounding air quality is more than 180 ppm then prototype will blow buzzer and send the alert messages to user.

VII. CONCLUSION

Thus, the spillage of the gas makes destructible effect the lives and as well with regards to the legacy of individuals. As a result, the system consists of an alarm unit whose buzzer indicates the presence of LPG volume. The essences of propane, isobutane, LPG, and even smoke are frequently detected by the sensors. The output of the LPG sensor changes to the active low (logic 0) condition if it detects a gas leak at work or at home. The LCD and buzzer are turned on by the Arduino UNO. After that, it even powers on the GSM, continues to send SMS to a mobile phone number specifically mentioned in the source code to warn user of danger. This device is used to prevent leakage of gases. By utilizing this system, we can cut down on gas leakage accidents. In peril circumstances we can save the life by utilizing this framework.

VIII. FUTURE SCOPE

With this system, additional software-based intelligent functions will be added to the project's future scope. This is a gas detection, control, and alert system that works automatically. In the future, this system will have the capability of notifying the emergency services in the event of an accident. Additionally, a web-based app and a mobile app for real-time monitoring will be added. Numerous intelligent features will be added to the system's user app. The system's overall features will make it safer for users. The system will be made to work best in a lot of places, like cars, homes, businesses, and many other places. The system will be put into use in a real-world situation after the final prototype is designed with clever multifunctional features.

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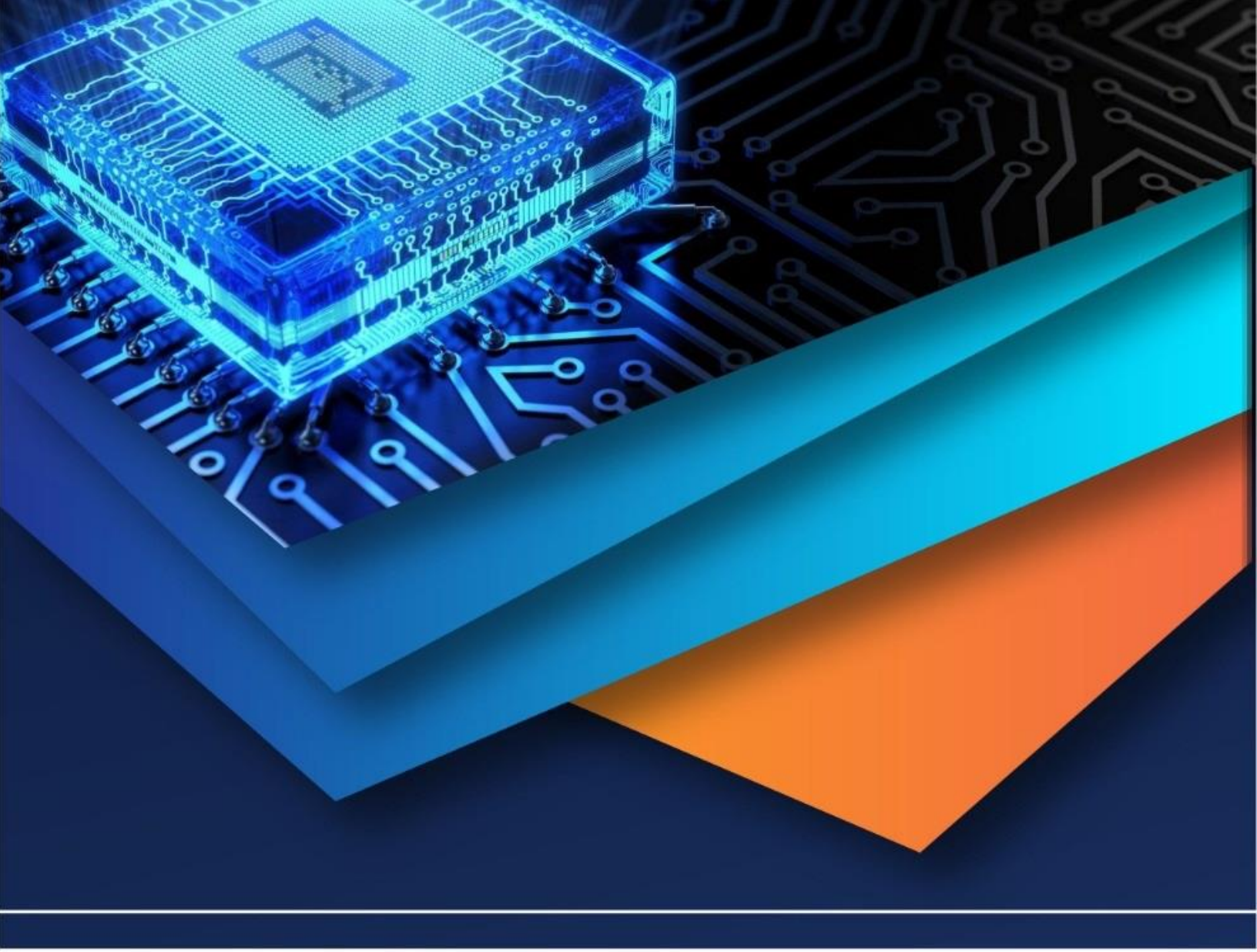
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