Automatic Gas Leakage Detection System

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I. EMPATHY FOR OUR PROJECT

FAMILY MEMBER:

We have children in our house, so if we went out there will be no safety for our children , there is a possibility of children playing with gas stove.

INDUSTRIES OWNER:

We have no safety for workers working in the gas industries.

HOTEL OWNER :

We have no safety in our hotel for leakage of gas.

DEFINE FOR OUR PROJECT

IT IS DIFFICULT TO FIND THE LEAKAGE OF GAS IN HOUSES, HOTELS, INDUSTRIES ETC….

Fig 1.9

Fig 1.10

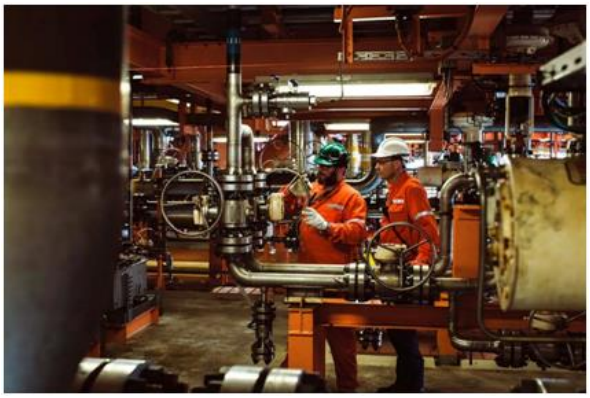

Fig 2.1

II. IDEATE FOR OUR PROJECT

IDEA 1

Develop a sensor based on the system that detects the leakage of gas. GSM module will help to indicate people by sending SMS alerts through mobile phones. It will also alert the surrounding people by voice of the alarm and If it is not possible, after a minute the regulator will automatically turn off by using Mg996R high torque servo motor.

IDEA 2

Based on the system that detects the leakage of gas, GSM Module will indicate people by calling them through their mobile phones.

IDEA 3

Based on the system that detects the leakage of gasin the industry ,the information will be conveyed immediately to the nearby fire station to check whether *any problem in the particular industry*

WE HAVE SELECTED THE IDEA 1

IDEATE 1

Gas Sensor:

Utilize a gas sensor that can detect the presence of potentially harmful gases, such as methane or propane. MQ series gas sensors are commonly used for this purpose.

Microcontroller:

Employ a microcontroller (e.g., Arduino or Raspberry Pi) to process sensor data and control the system's functionalities.

GSM Module:

Integrate a GSM module (like SIM800L or SIM900) to enable communication via SMS. This module allows the system to send alerts to designated phone numbers.

Alarm System:

Incorporate a loud alarm system to alert people in the vicinity. This could be a buzzer or a speaker that emits a loud sound when gas leakage is detected.

Servo Motor (Mg996R):

To automate the gas supply cutoff, use a high-torque servo motor like the Mg996R. This motor will control the gas regulator's valve to shut it off when a gas leak is detected.

Power Supply:

Ensure a stable and reliable power supply for continuous operation. This could be achieved using a battery or an external power source.

Alert Mechanisms:

SMS Alert: The microcontroller triggers the GSM module to send SMS alerts to predefined phone numbers, indicating the gas leak and providing information about the location.

Audible Alarm: Simultaneously, the microcontroller activates the alarm system to produce a loud sound, alerting people in the vicinity.

Automatic Gas Cutoff:

The microcontroller signals the high-torque servo motor to actuate and turn off the gas regulator after a predetermined delay (e.g., one minute).

This delay allows time for occupants to evacuate the area before the gas supply is shut off automatically.

Status Monitoring:

The system can continuously monitor the gas levels and the status of the gas supply.

Users can receive periodic updates via SMS to ensure the system's ongoing functionality.

III. PROTOTYPE FOR OUR PROJECTS

COMPONENTS OF PROTOTYPE :

- ARDUINO UNO
- SIM800L GSM MODULE
- MGQ996R HIGH TORQUE MOTOR
- GAS SENSOR
- BUZZER AND LED
- JUMPER CABLE
- LED

ARDUINO UNO:

The Arduino Uno is a popular open-source microcontroller board based on the ATmega328P microcontroller. Developed by Arduino.cc, it is a versatile and user-friendly platform widely used in the field of electronics and embedded systems

Fig 2.2

The board features digital and analog input/output pins, a USB interface for programming and communication, a power jack, and an ICSP (In-Circuit Serial Programming) header. Arduino Uno is often utilized by hobbyists, students, and professionals for prototyping and creating various electronic projects due to its ease of use, extensive community support, and a vast array of available libraries and shields. It can be programmed using the Arduino Integrated Development Environment (IDE), which simplifies the process of writing and uploading code to the board.

JUMBER CABLES:

Fig 2.3

A jumper cable, in the context of Arduino and electronics, **r**efers to a flexible wire with connectors at each end, designed to establish electrical connections between different components on a circuit or between an Arduino board and external modules. These cables play a crucial role in prototyping and experimenting with electronic circuits by allowing users to create temporary links without the need for soldering. Jumper cables are typically equipped with male or female connectors, such as pins or sockets, enabling them to be easily plugged into the designated ports on an Arduino board or other electronic components. Their flexibility and ease of use make jumper cables an essential tool for connecting sensors, actuators, and various modules to an Arduino, facilitating the rapid and flexible assembly of circuits during the development and testing phases of electronic project.

LED(Light Emitting Diode):

Fig 2.4

Light Emitting Diodes, commonly known as LEDs, are semiconductor devices that emit light when an electric current passes through them. They have become integral components in various electronic applications, owing to their energy efficiency, durability, and versatility. The fundamental principle behind an LED's operation involves the recombination of electrons and electron holes within the semiconductor material, resulting in the release of photons. This process is known as electroluminescence. LEDs come in various colors, including red, green, blue, and white, each corresponding to specific semiconductor materials and energy levels

One of the key advantages of LEDs is their efficiency in converting electrical energy into light, making them more energy-efficient than traditional incandescent bulbs. Additionally, LEDs have a longer lifespan and are more robust, as they lack the fragile filament found in incandescent bulbs. LEDs find widespread use in applications such as indicator lights, display screens, automotive lighting, and general illumination.

LEDs are characterized by their compact size, low power consumption, and ability to emit light in a specific direction. They are also compatible with digital control, allowing for the creation of dynamic lighting effects and programmable displays. As the technology continues to advance, LEDs play a pivotal role in the ongoing evolution of energy-efficient and environmentally friendly lighting solution ns.

The SIM800L GSM module is a compact and versatile communication module that belongs to the family of GSM (Global System for Mobile Communications) modules. These modules are designed for wireless communication and are commonly used in applications such as mobile phones, IoT (Internet of Things) devices, and other projects that require cellular connectivity.

Fig 2.5

Communication Technology: SIM800L is a GSM/GPRS (Global Packet Radio Service) module, meaning it can be used for voice communication as well as data transmission.

Features: The module typically supports features such as SMS (Short Message Service), GPRS data transfer, voice communication, and can be interfaced with microcontrollers or other embedded systems.

Compact Size: One of the notable characteristics of the SIM800L module is its small form factor, making it suitable for projects with space constraints.

Power Requirements: It operates on low power and can be powered by a 3.4V to 4.4V DC power supply.

Interfaces: The module can be interfaced with a microcontroller or other electronic devices using UART (Universal Asynchronous Receiver-Transmitter) communication.

Antenna: It requires an external antenna for better signal reception.

Applications: SIM800L modules are commonly used in various applications, including remote monitoring systems, home automation, vehicle tracking, and other projects that involve remote communication over GSM networks.

The term "MGQ996R HIGH TORQUE MOTOR" likely refers to a specific model of a high-torque servo motor. Servo motors are commonly used in various applications, including robotics, remote-controlled vehicles, and other electronic projects.

Fig 2.6

MGQ996R: This appears to be the model or product code of the servo motor. Different manufacturers use various naming conventions and codes for their products.

HIGH TORQUE: This indicates that the motor is designed to provide a high amount of torque. Torque is the rotational force that a motor can exert, and high torque is often required for applications that involve moving heavy loads or providing strong, precise movements.

MOTOR: This is a general term referring to a device that converts electrical energy into mechanical motion

A gas sensor is a device designed to detect and measure the presence of specific gases in the surrounding environment. These sensors are commonly used for various purposes, including safety, environmental monitoring, and industrial processes. Gas sensors can detect the concentration of gases such as carbon monoxide, methane, hydrogen, ammonia, and many others…

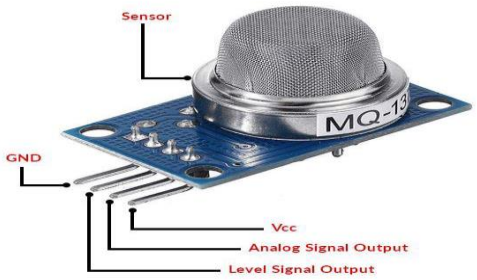

Fig 2.7

Electrochemical Gas Sensors: These sensors use chemical reactions to generate electrical currents, and the resulting current is proportional to the gas concentration.

Semiconductor Gas Sensors: These sensors rely on changes in electrical conductivity of a semiconductor material when exposed to gas.

Infrared Gas Sensors: These sensors detect gases based on their absorption of infrared radiation. Each gas absorbs infrared light at specific wavelengths.

Catalytic Bead Sensors: These sensors use a heated coil or bead coated with a catalyst that reacts with certain gases, causing changes in temperature that are then measured.

Photoionization Detectors (PID): These sensors use ultraviolet light to ionize gas molecules, and the resulting electrical current is measured.

BUZZER :

Fig 2.8

A buzzer is an electrical device that produces a buzzing or beeping sound when an electrical current is passed through it. It is essentially an electroacoustic transducer that converts electrical energy into sound waves. The basic components of a buzzer include an electromagnet and a diaphragm or a piezoelectric element. When an electric current flows through the coil of the electromagnet, it creates a magnetic field that causes the diaphragm to vibrate, generating sound.

There are different types of buzzers, including electromagnetic buzzers and piezoelectric buzzers. Electromagnetic buzzers use an electromagnet and a diaphragm, while piezoelectric buzzers utilize a piezoelectric crystal that vibrates when an electric field is applied.

Buzzers find widespread applications in various electronic devices and systems for signaling and alert purposes. They are commonly used in alarms, timers, doorbells, game consoles, and industrial control systems. The simplicity, reliability, and effectiveness of buzzers make them essential components in situations where a clear and attention-grabbing auditory alert is needed.