

University Of Petroleum And Energy Studies



Internship - High Level Design on IoT Based Gas Leakage Monitoring System using FPGA

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1. Introduction

1.1 Scope of the document

The internet of Things is a developing topic of technical, social, and economic significance. Consumer products, hard-wearing goods, cars and trucks, industrial and utility Components, sensors, and additional everyday objects are being united with Internet connectivity and powerful data analytic competences that promise to transform the method we work and all other routines as well. The Internet of Things (IOT) is a significant topic in technology industry, policy, and engineering circles and has become front-page news in both the specially press and the popular media. This technology is embodied in a wide spectrum of networked products, systems and sensors, which take the advantages of development in computing power, electronics miniaturization, and network interconnection to offer new abilities not previously possible

1.2 Intended Audience

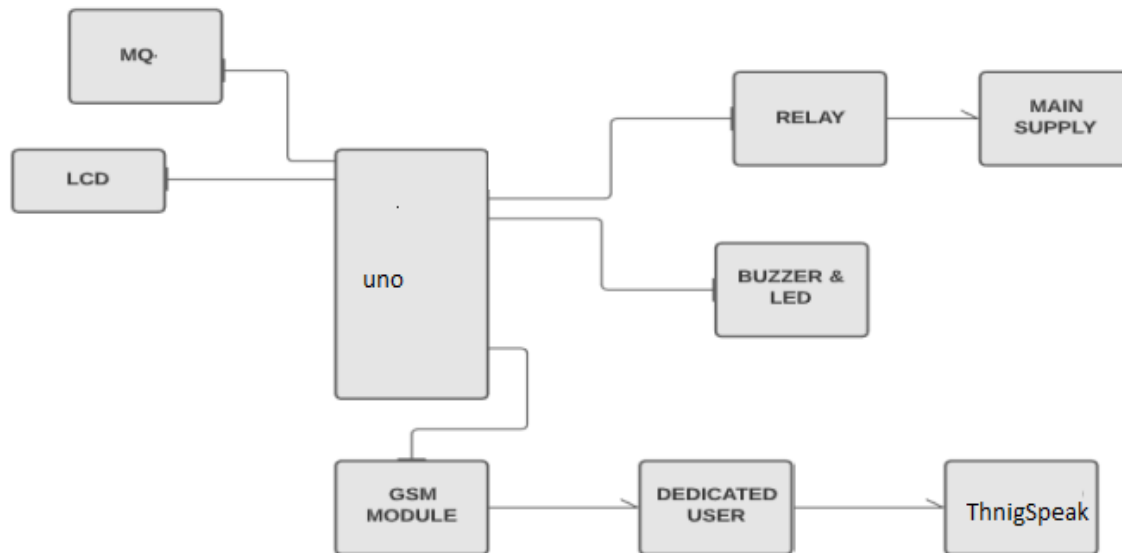
Gas leak detection is the process of identifying potentially hazardous gas leaks by means of sensors. The primary objective of this project is to design a Gas Leakage Detection and Monitoring system for industries and homes, which is based on the FGPA or its prototype, Arduino. The proposed system uses an MQ2 Gas Sensor Module, which is interfaced with the Arduino board , further board will send the instruction to Realy which will cut OFF the Running Power, the total circuit units are arranged on the breadboard. Leaks of harmful gases cause both material loss and human injuries. As the effect of harmful gases on human health became more evident, gas leak detection methods became more important.

1.3 System Overview

In our project we have used the following components to make it unique and different from other Gas Leakage Monitoring System projects on the Internet: GSM module, Mq2 (Gas sensor), Relay ,Lcd and buzzer moreover using Arduino is being taken as the most common base to not to specify much about it. The MQ sensor here is used to detect the gas round the region. The GSM module is used in our project as a proper tool for sending SMS to emergency responders. We used the AT commands for communicating between the Arduino and GSM modules. When Arduino receives these signals, it performs the resultant action in response, which may contain the ringing of the buzzer ,Cutting off the main supply using Relay Module and the SMS generating process. The goal of this project is to alert emergency responders about the emergence of fires around factories and homes. It is very important to detect the disaster early and create a healthy environment.

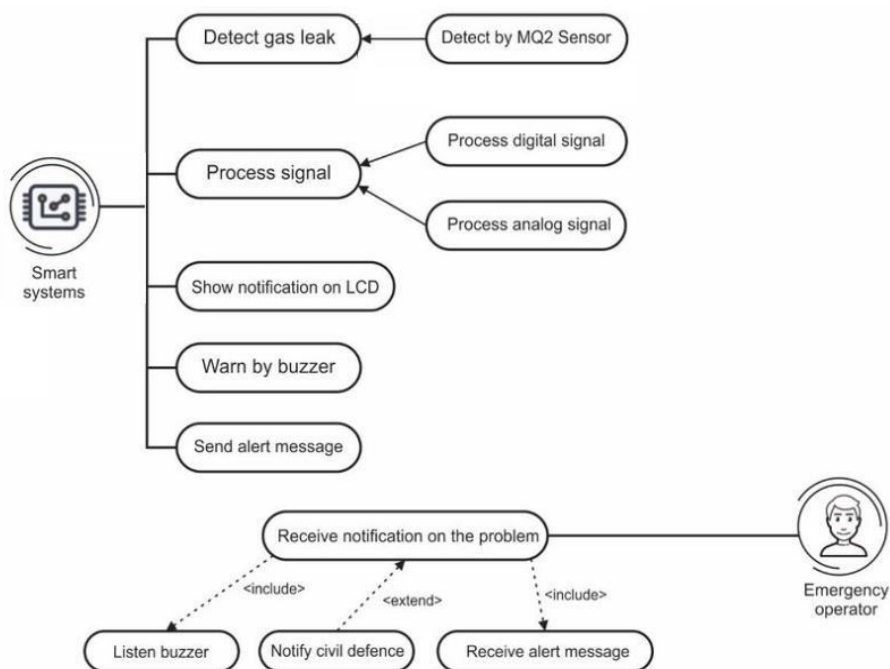
2. System Design

2.1 Application Design



The MQ sensor detects the gas around the Further the gas sensor is used to detect the gas particles and trigger the buzzer so the alarm works in a fine and proper way. When Arduino receives these signals, it performs the resultant action in response, which contains a SMS generating process through the GSM module. At last, the information is sent to the user and main supply will be cut off and Buzzer will bell.

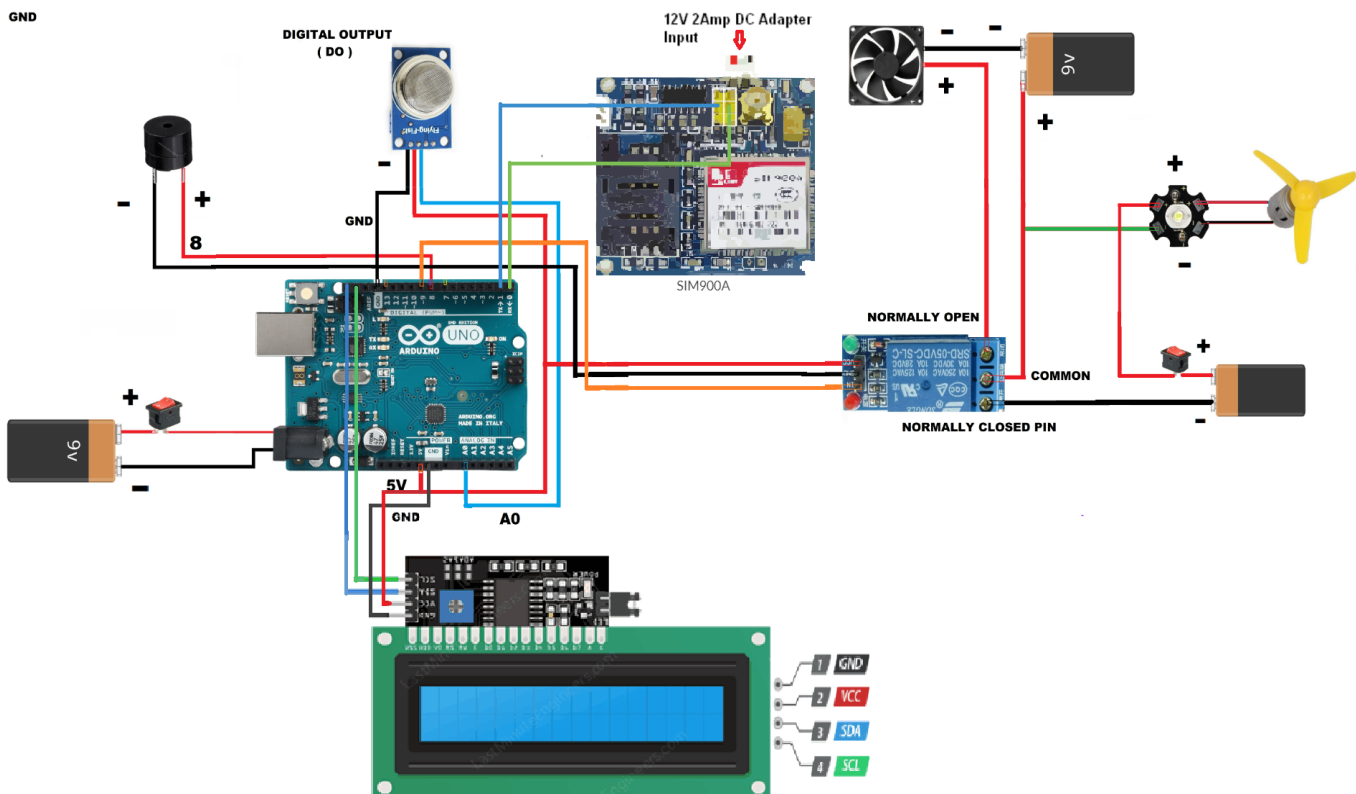
2.2 Process Flow



2.3 Information Flow

Gas leakage is detected through gas sensor MQ2 which is interfaced through Arduino. It will send the analog and the digital value to the Arduino. Along with the Arduino board we have interfaced a buzzer. It will ring when the gas is leaked and the sensor will detect it for the next five seconds. We have also used a relay module which controls one electrical circuit by opening and closing contacts in another circuit. As soon as the gas leakage is detected instantly a signal is sent through the MQ2 sensor to the Arduino. Once the signal is received in Arduino, all the electric devices get turned off through the relay which turns on the exhaust fan and also turns on the beep sound of the alarm. It alerts the person who is at some distant point from the spot. After some time when the gas goes down or is not detected, it subsequently turns on all the relay and electronic devices. We have also interfaced an LCD which is used for displaying the status of gas leakage. The detection system uses to detect the leakage and automatically initiate a warning message through a GSM.

2.4 Component Design



3. Interfaces

ThingSpeak provides instant visualizations of data posted by your devices to ThingSpeak. With the ability to execute MATLAB® code in ThingSpeak you can perform online analysis and processing of the data as it comes in. It is often used for prototyping and proof of concept IoT systems that require analytics. It also stores data in private channels by default, but public channels can be used to share data with others. Once data is in a ThingSpeak channel, you can analyze and visualize it, calculate new data, or interact with social media, web services, and other devices, here we are using GSM module to send the data to ThingSpeak, we have created the private channels and with the API key we are sending the data to the this cloud platform. It will help user to detect how gas value increased during any disaster.



4. State and Session Management

In session management every time we got a new session until the end-user got the notification generated by the Gas Leakage Monitoring we use a gas sensor, in our project, If gas leaked near to the sensor then it produces a message by taking Arduino in between. By interfacing a Mq2 Sensor (Gas Detection sensor) with Arduino, you can detect gas leaks and activate a buzzer. After that, the session goes to another step which is the GSM module. The Arduino GSM shield allows an Arduino board to connect to the internet, send and receive SMS, and make voice calls using the GSM library. The shield will work with the Arduino Uno out of the box. By connecting Arduino with GSM through a software serial library. The functions `SENDMESSAGE()`, `RECEIVEMESSAGE()` in which we send commands to the GSM module from Arduino. These commands used to communicate with the GSM module are called AT Commands. There are different commands to perform different tasks using the GSM module. GSM is the present scenario and current technology. GSM Module allows you to add location-tracking, voice, text, SMS, and data to your application. The big advantage of GSM Connectivity is, that it covers a wide area and signal/connectivity is available almost everywhere. We will Monitor the Gas Leakage using a Mq2 Sensor. The Gas Leakage data will be sent to the cloud server using AT Commands for GSM Module. A cloud server is an effective platform for providing remote service.