University Of Petroleum And Energy Studies

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

SUBMITTED BY

Ayush Nautiyal R200220086
Ashish Bisht R200220081
Shivam Negi R200220050
Himanshu Bhandari R200220095

GUIDED BY
Dr.Tarandeep Kaur Bhatia

Industry Mentor: Mr. Mohsin Qureshi

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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

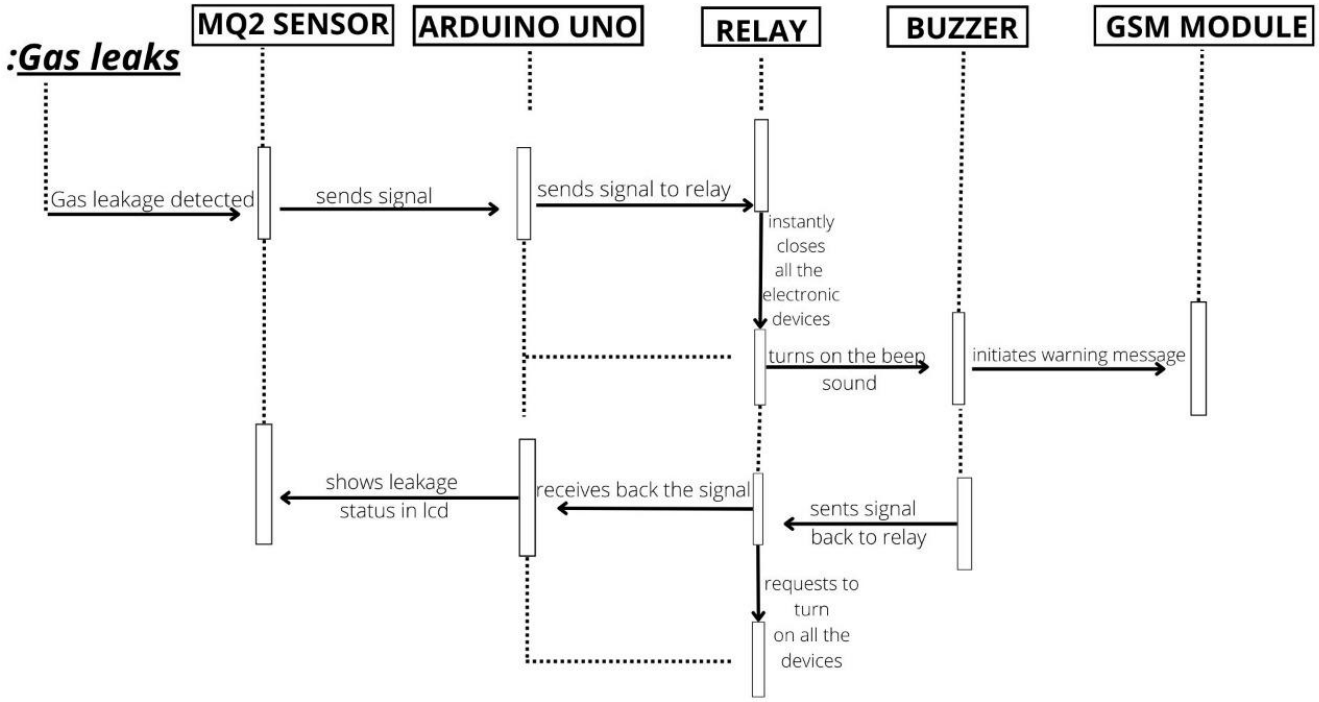
1.2 Intended Audience

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.

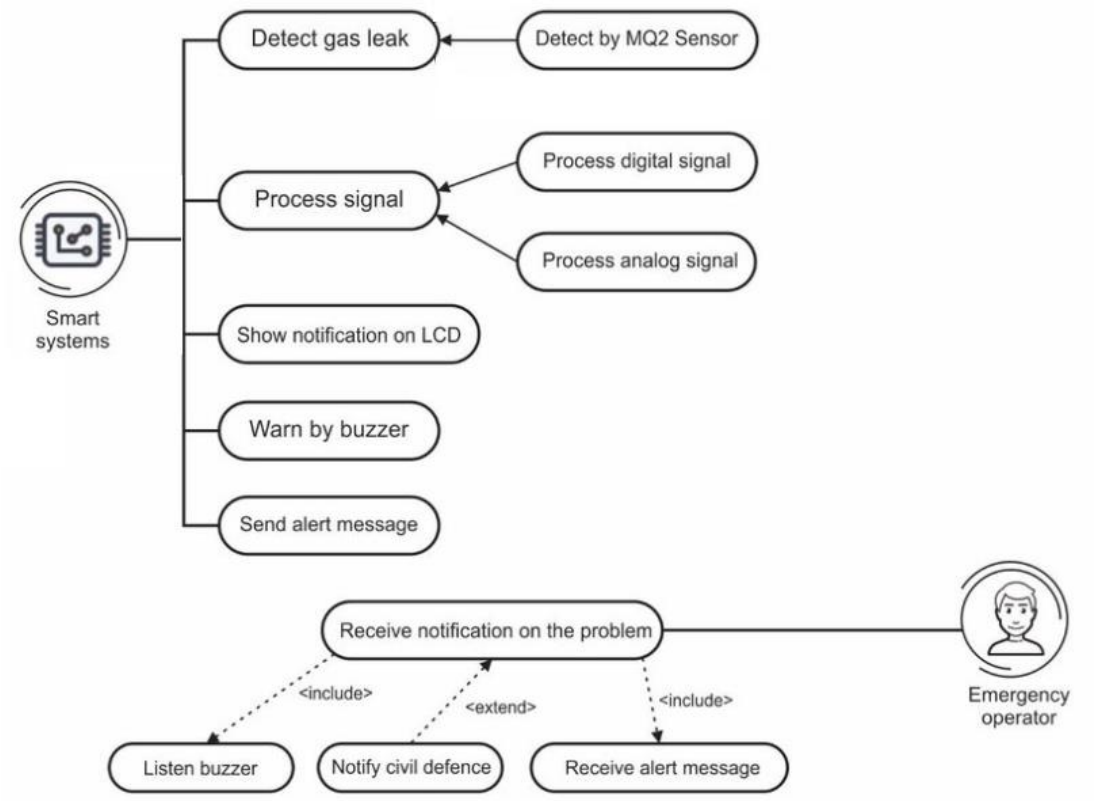
2. Low Level System Design

Arduino Software (IDE) - contains a text editor for writing code, a message area, a text console, a toolbar with buttons for common functions and a series of menus. It connects to the Arduino hardware to upload programs and communicate with them.
Programs written using Arduino Software (IDE) are called sketches. These sketches are written in the text editor and are saved with the file extension .ino.
Arduino is a prototype platform (open-source) based on easy-to-use hardware and software. It consists of a circuit board, which can be programmed (referred to as a microcontroller) and a ready-made software called Arduino IDE (Integrated Development Environment), which is used to write and upload the computer code to the physical board.

2.1 Sequence Diagram



2.2 Components Design Implementation



2.3 Connections:

1. MQ2 Sensor
   - VCC----------> +5V
   - GND----------> GND
   - DO ----------> Digital pin 2
   - AO ----------> Analog pin AO

2. PIEZO BUZZER:
   - (+) ----------> 8
   - (-) ----------> Digital pin GND

3. Relay
   - VCC---------->+5v
   - GND---------->GND
   - IN---------->Digital pin 11

4. GSM GPRS MODULE:
   - TX---------->9
   - RX---------->10
   - GND---------->GND

5.16x2 LCD display_I2C interface
   - VCC----------> +5V
   - GND----------> GND
   - SDL----------> Digital pin SDL
   - SCL ----------> Digital pin SCL

3. DETAILS OF OTHER FRAMEWORKS BEING USED

3.1 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.

4. Unit Testing

S.No.	Component	Test Case	Expected Result
1	GSM Module	After getting the signal of fire, the GSM module sends a message to the user.	The message was sent successfully.
2	LCD	Analog value will be Print over lcd	Monitor the Smoke level
3	MQ2 Gas Sensor	In case of smoke the Gas Sensor detects the smoke and sends a signal.	The MQ2 Gas sensor detects the fire and sent the signal successfully.
4	Piezo Buzzer	After detecting the signal from sensors buzzer makes a noise.	Buzzer makes noise successfully.