

GAS LEAKAGE DETECTION SYSTEM USING IoT WITH INTEGRATED NOTIFICATIONS

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ABSTRACT

In the past few years there is a rise in home automation systems which benefit the need for people using methods of Internet of Things (IoT). The main idea of this project is to carry out the novel technique of IoT based gas detection and to ensure the safety of people and surroundings. By presenting a simple yet reliable system, gas leakage detection system using MQ6 gas sensor and Arduino microcontroller with inbuilt Wi-Fi (NodeMCU) is incorporated with cloud storage for data collection and also used for storing and analyzing data. Gas leaked is converted from Parts per Million (PPM) to volt through the Arduino IDE and results in notifying the user when the threshold limit is crossed. The user is alerted via an application for quick notification through the internet and also through a buzzer /LED for physical notification.

INTRODUCTION

LPG is that the abbreviation or short kind for liquefied oil gas. Like all fossil fuels, it's a non-renewable supply of energy. It is extracted from fossil oil and gas. The most compositions of LPG square measure Hydrocarbons containing three or four carbon atoms.

The conventional parts of LPG so, square measure gas (ClHa) and alkane (CaHro). Tiny concentrations of alternative hydrocarbons may additionally be gift betting on the supply of the LPG and the way it's been created, parts apart from hydrocarbons may additionally be gift. LPG is extremely combustible and should thus be hold on off from sources of ignition and during a well-ventilated space, in order that any run will disperse safely. LPG vapors is heavier than air, thus care ought to be taken throughout storage in order that any run won't sink to the bottom and find accumulated in a district that is low lying and tough to disperse.

Gas leakage is a major concern with residential, commercial premises and gas-powered transportation vehicles. One of the preventive measures to avoid the danger associated with gas leakage is to install a gas leakage detector at vulnerable locations. So, the gas detection system not only monitors the surroundings continuously but also prevents the further leakage of gas in the environment which minimizes the chance of fire. A gas leakage system makes use of an MQ6 sensor for detection of LPG leakage. The MQ6 gas sensor detects the concentration of gas

in ppm and outputs analog value. It is converted to volts through Arduino IDE. Blynk app shows the gas level in ppm. When there is a gas leakage detected, user will be alerted through a buzzer and red led on at home. Also, user will be alerted via a popup message from Blynk App and through mail. Thus, this helps in reducing the risk of fire accidents immediately by using a smartphone when there is an emergency.

HARDWARE COMPONENTS

NodeMCU is an open-source firmware for which open-source prototyping board designs are available. The name “NodeMCU” combines “node” and “MCU” (micro-controller unit). The term “NodeMCU” strictly speaking refers to the firmware rather than the associated development kits. Both the firmware and prototyping board designs are open source. NodeMCU ESP8266 and NodeMCU ESP32 are becoming very popular and are almost used in more than 50% IoT based projects today.

The firmware uses the Lua scripting language. The firmware is based on the eLua project and built on the Espressif Non-OS SDK for ESP8266. It uses many open-source projects, such as lua-cjson and SPIFFS. Due to resource constraints, users need to select the modules relevant for their project and build a firmware tailored to their needs. Support for the 32-bit ESP32 has also been implemented.

The prototyping hardware typically used is a circuit board functioning as a dual in-line package (DIP) which integrates a USB controller with a smaller surface-mounted board containing the MCU and antenna. The choice of the DIP format allows for easy prototyping on breadboards. The design was initially based on the ESP-12 module of the ESP8266, which is a Wi-Fi SoC integrated with a Tensilica Xtensa LX106 core, widely used in IoT applications.

The device is especially useful for IoT applications, due to its small footprint and built-in Wi-Fi support. ESP8266 Integrates 802.11b / g / n HT40 Wi-Fi transceiver, so it can only connect to a Wi-Fi network and interact with the Internet. It can also set up its own network, allowing other devices to connect directly to it. There is a board controller that ensures very clean power on the MCU itself, as well as a push-button reset and USB connection to make it easier to connect to your computer.

Transformer is a static device used to convert the voltage from one level to another level without change its frequency. There are two types of transformers

1. Step-uptransformer

2. Step-downtransformer

Step-up transformer converts low voltage level into high voltage level without change its frequency.

Step-down transformer converts high voltage level into low voltage level without change its frequency. In this project we using step-down transformer which converts 230V AC to 12V AC [or] 230V AC to 5V.

The MQ-6 module is used in gas leakage detecting equipment in family and industry, this module has high sensitivity to LPG, iso-butane, propane and LNG. It can also be used to detect the presence of alcohol, cooking fumes, and cigarette smoke. The module gives out the concentration of the gases as a analog voltage equivalent to the concentration of the gases. The module also has an onboard comparator for comparing against an adjustable preset value and giving out a digital high or low.

This is a simple-to-use MQ-6 Liquefied Petroleum, iso-butane, propane gas Sensor module, suitable for sensing LPG (composed of mostly propane and butane) concentrations in the air. The MQ-6 can detect gas concentrations anywhere from 200 to 10000ppm. This sensor has a high sensitivity and fast response time. The sensor's output is an analog resistance. The drive circuit is very simple; all you need to do is power the heater coil with 5V, add a load resistance, and connect the output to an ADC.

Sensitive material of MQ-6 gas sensor is SnO₂, which with lower conductivity in clean air. When the target combustible gas exists, the sensor's conductivity is higher along with the gas concentration rising. Please use simple electro circuit, convert change of conductivity to correspond output signal of gas concentration. MQ-6 gas sensor has high sensitivity to Propane, Butane and LPG, also response to Natural gas. The sensor could be used to detect different combustible gas, especially Methane, it is with low cost and suitable for different application.

SOFTWARES

Arduino is a prototype platform (open-source) based on an easy-to-use hardware and software. It consists of a circuit board, which can be programmed (referred to as a microcontroller) and ready-made software called Arduino IDE (Integrated Development Environment), which is used to write and upload the computer code to the physical board.

The key features are:

- by sending a set of instructions to the microcontroller on the board via Arduino

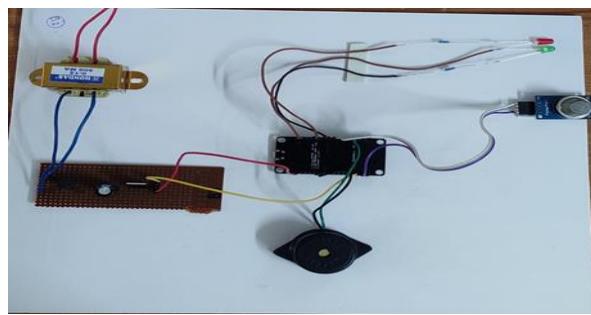
IDE (referred to as uploading software).

- Arduino boards are able to read analog or digital input signals from different sensors and turn it into an output such as activating a motor, turning LED on/off, connect to the cloud and many other actions.
- You can control your board functions
- Unlike most previous programmable circuit boards, Arduino does not need an extra piece of hardware (called a programmer) in order to load a new code onto the board. You can simply use a Usb.
- Additionally, the Arduino IDE uses a simplified version of C++, making it easier to learn to program.
- Finally, Arduino provides a standard form factor that breaks the functions of the micro-controller into a more accessible package.
- After learning about the main parts of the Arduino UNO board, we are ready to learn howto set up the Arduino IDE. Once
- We learn this, we will be ready to upload our program on the Arduino board.

WORKING

- The MQ-6 gas sensor has a sensitive filament which is made of SnO₂.
- When there is no presence of gas or the air is clean then, the filament will tend to have low electrical conductivity.
- If the sensor detects combustible gas like LPG, the filament's electrical conductivity rises.
- The amount of change in filament's conductance or resistance is used to indicate the equivalent gas concentration.
- In this project we will be using Blynk esp8266 based NodeMCU.

When the gas concentration will increase, a Blynk notification will be sent to your smartphone. Also, there will be a warning sign with Red LED ON and buzzer beep sound. This is how this gas leakage detection system works.



CONCLUSION

- The IoT Gas Leakage System makes the detection of the gas and its prevention much easier.
- The system sends alert notifications to the user and the user responds accordingly with the help of the connected devices like a smartphone from any location.
- The IoT based toxic gas detector is cost efficient.
- This integrated system has taken IoT to next level and has helped people meet their business requirements

REFERENCES

- [1] Anandhakrishnan S, Deepesh Nair, Rakesh K, Sampath K, Gayathri S Nair “ IOT Based Smart Gas Monitoring System ” IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE) 2018.

- [2] Ch.Manohar Raju, N. Sushma Rani. "An android based automatic gas detection and indication robot". In International Journal of Computer Engineering and Applications. 2014; 8(1).
- [3] Metta Santiputri, Muhammad Tio "IoT-based Gas Leak Detection Device" 978-1-5386-8066-7/18/\$31.00 ©2018 IEEE.
- [4] Pal-Stefan Murvaya, Ioan Sileaa. "A survey on gas leak detection and localization techniques."
- [5] Rohan Chandra Pandey, Manish Verma, Lumesh Kumar Sahu "Internet of Things (IOT) Based Gas Leakage Monitoring and Alerting System with MQ-2 Sensor, © 2017 IJEDR | Volume 5, Issue 2 | ISSN: 2321-9939 www.ijcrt.org © 2020 IJCRT | Volume 8, Issue 9 September 2020 | ISSN: 2320-2882 IJCRT2009123 International Journal of Creative Research Thoughts (IJCRT) www.ijcrt.org 927
- [6] Shital Imade, Priyanka Rajmanes , Aishwarya Gavali , Prof. V. N. Nayakwadi "GAS LEAKAGE DETECTION AND SMART ALERTING SYSTEM USING IOT" International Journal of Innovative Research & Studies Volume 8, Issue II, FEB/2018 ISSN NO : 2319-9725.
- [7] S Shyamaladevi, V G Rajaramya, P Rajasekar, P Sebastin Ashok. ARM7 based automated high-performance system for lpg refill booking & leakage detection. 2014; 3(2).
- [8] Zhao Yang, Mingliang Liu, Min Shao, Yingjie Ji Research on leakage detection and analysis of leakage point in the gas pipeline system. In Open Journal of Safety Science and Technology; 2011