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[Dr. Mohammad Monirujjaman Khan. "Sensor Based Gas Leakage Detector System", Proceedings of 7th International Electronic Conference on Sensors and Applications, 2020](#)

Abstract: - We know that there are many incidents that occurs in our community like gas and fire explosions due to LPG gas leakage. Such incident can cause very dangerous impact in human life and their property. So IOT related LPG gas leakage detection system can make these kinds of problem solved by sending alert message to the people if gas automatically got leaked at house, vehicles and industrial area etc. In this system we will be using Node MCU as a role of controller, for alarm Buzzer, LED for light signal and MQ -6 as gas sensor. Introduction: - In this project we are developing Liquid Petroleum Gas (LPG) detection system. As we know that LPG gas is combination of Propane and Butane which is mixture of Hydrocarbon gases that can be used in many appliances like vehicles, cooking instrument and industrial areas. Nowadays LPG gas is widely used in different fields like heating gases, cooking, hot water, different vehicles, researches areas, etc. throughout the world. As we already know that there is wide area of usage of LPG gas so there will be also high chances of the occurrences of accident due to the explosion of LPG gas. There is the increase in the death of the people due LPG gas explosion so we need to have a system that will control and monitor such kind of leakage with Alert system. This system can alert the user about the gas leakage by sending SMS to the Client. This system will send message to the everyone in the building, vehicles, Laboratories after the certain gas density crossed and level is dangerous. Aims: - The main motive of our project is to detect and monitor leakage of LPG gases in Laboratories, Vehicles, Kitchens, Industrial Areas. This system will give alert message with signal light and buzzer and this system will also forward [notification to gas leakage control panel after the gas detection](#). Objectives: - The objectives of our system [are](#) listed below: - • • • [The main motive of our system is to inspect automatic and smart gas detection system. It will help to save money and reduce the high risk. It will save the life of people and their belonging by helping to control the LPG gas explosion.](#) • This system will alert [the investigation team before the leakage gas amount crosses the limit.](#) Background/Justification: - Scenario [1: - Problems Figure 1:](#) Scenario displaying problems Scenario [2: - Solutions Figure 2:](#) Scenario displaying [solution Figure 3:](#) Scenario displaying [problem's notification](#) The above storyboard is all about the how to solve the problem of LPG gas leakage and detection of the gas and how to notify the people that there is gas leaked by the alert notification. The scenario 1 is describing or displaying the problem of LPG gas leakage. In the scenario, the owner of the laboratory is travelling out of the laboratory for some official work and he said to his coworker to look after the lab. After completion of the work the owner returns to his laboratory all the LPG gas were leaked and the coworker has no idea that when the gases were leaked and all gases were wasted. In scenario 2, LPG gas leakage detection system is implemented in the laboratory and after the leakage of LPG gas the coworker is notified with Red light and buzzer and he checked the leakage of the LPG gas and simultaneously the owner of the laboratory is notified with the gas leakage message and he is thinking of calling his coworker and in this way the LPG gas leakage problem is solved that might cause the exploration of the laboratory and other important belonging in that laboratory. Parts Required: - Node MCU: - Node MCU [is an open-source development kit that](#) is used [to](#) develop the [prototype](#) of [IOT](#) products. It [uses the Lua scripting language](#). It has inbuilt [Wi-Fi module](#) and [is](#) cheaper

and data and power is supplied through USB cable. Figure 4: Node MCU Breadboard: - I have used Breadboard in my IOT project for the testing of the electronic components and circuit. It helps to remove the wires and components soldering while making circuit. Breadboard is wired together underside for the flow of electricity from one component to another component. It is plastic box having a number of holes that is arranged in particular fashion. It will make more easier to built our IOT device that is LPG gas leakage detector. Figure 5: Breadboard MQ-6 Gas Sensor: - I have used MQ-6 gas sensor in my IOT project to detect Liquid Petroleum Gas. The reason for using this sensor is because it is specialized for the detection and measure of the LPG and butane in air. It consists of four pins and they are VCC, Ground, Digital Out, Analog Out. Each pin has their own workload. Figure 6: MQ-6 Gas Sensor Buzzer: - I have used Buzzer in my IOT project to provide the warning message and alert about the leakage of LPG gas through audio signal. It will help the people around the LPG gas leakage area by alert warning people can run away from there. It is based on the functionality of changing electrical energy into sound energy. It consists of two pin that is positive and negative pin. Figure 7: Buzzer LED Lights: - LED is an electronic device that emits light when electrical current is passed through it. I have used two LED for the signal light and they are Red and Green. Green LED will glow when there is no leakage of the LPG gas or normal condition. Similarly, Red LED will glow when the system detects the leakage of LPG gas. Figure 8: LED Lights Jumper Wires: - There are mainly three type of jumper wires and they are male to male, female to female, male to female. In my IOT project I have used male to male and male to female jumper wires. It is used to interconnect the components of breadboard or another prototype. Figure 9: Jumper Wires How does it Work: - Circuit Diagram: - Figure 10: Circuit diagram drawn in paint Simple Circuit Diagram: - Figure 11: Simple Circuit Diagram Connection: - Working Process: - Our LPG gas leakage detection system is formed from Node MCU ESP8266 module, Buzzer, LED lights, MQ-6 Gas Sensor, breadboard and Jumper Wires. The system will only work nearby the location the LPG gas is stored or leak aged. The system I have developed will only detect the leakage of LPG gas if the leakage of gas occurs only nearby the system with the help of MQ-6 gas sensor. The digital output pin DO of MQ-6 gas sensor will collect the signal from the surrounding and transfer the signal to the digital pin D8 of the node MCU. And for analog output AO of Gas Sensor will transfer data to the AO of the node MCU. After then the Node MCU will process the signal that are retrieved from the gas sensor and if the Node MCU detect the leakage of the gas then it will active the Buzzer that has connected the positive end of buzzer to the Digital pin D4 of the node MCU. Similarly, node MCU will send signal to the RED LED that is connected to the digital pin D6 and it will glow for the danger alert. Node MCU will also send the Message notification the Mobile Device with the help of managed Cloud (IFTTT). I have written code for the managed cloud in Node MCU that will send message to mobile device if gas is leaked. If there is no detection of LPG gas then Green LED will glow that is connected to the Digital pin D7 of the node MCU. Block Diagram for LPG gas leakage Detection System: - Figure 12: Block Diagram of LPG gas leakage detection system circuit The link below is the video link of the LPG gas leakage detection system that I have developed. https://youtu.be/BaiOlhO_Txs The Build: - • Before the LPG gas leakage detected: (glow of green led) Figure 13: glow of green led before LPG gas leakage detected • After the LPG gas leakage detected: (glow of red led) Figure 14: glow of red led after the LPG gas leakage detected Test of Sensor Value: - Before the LPG gas leakage detected the normal sensor, value is 200. Figure 15: the initial value of the serial port before testing The value of gas sensor will raise up and gradually will crosses the more than 200, if LPG gas

leakage is detected. Figure 16: serial port value of gas sensor after the testing LPG Gas Leakage message through SMS Notification: - Figure 17: Gas Leakage SMS in Mobile through IFTTT Implementation/Sketching: - I have used Arduino IDE with ESP8266 Board for the coding and programming of the LPG gas leakage detection system. Arduino IDE Figure 18: Initial phase of Arduino IDE For the installation of ESP8266 we have to go through several steps and steps are listed below: - Process-1: - Installation of ESP8266 Figure 19: Process-1 for the installation of ESP8266 Board Process-2: - Selection of board manager URL Figure 20: Process-2 for selection of board manager URL Process-3: - Selection for the board manager tools Figure 21: Process for the selection of board manager tools Process-4: - Installed [Board Manager after clicking on Install button Figure 22: installed Board Manager after clicking install button](#) To display the information that will be processed in the system I have used serial port "COM5" after the completion of the Board Manager installation. Figure 23: To show the result in the serial monitor use of serial port "COM5" Code: - The code for the setup and connection of Wi-Fi and also for the leakage notification message is shown below: - Figure 24: Pin selection and Wi-Fi connection code Figure 25: Code for the leakage notification Code to glow LED and to run Buzzer. Figure 26: Code for the LED and Buzzer functionality Future Scope: - This System can be used in the smart home application that will detect and monitor the leakage of LPG gas. This system can be used for the safety method in Industries, Home, Vehicles. This system has got a lot of future scope like we can develop smart device that can turn off LPG gas supply if there is leakage of the LPG gas. This kind of system can be used in such areas where LPG cylinders and gas burner are used like Restaurants, research Lab, schools, colleges, Industries, Vehicles etc. Conclusion: - I have successfully developed and implement the implement the LPG leakage detection system. After the completion and implementation of the system I have found that MQ- 6 gas sensor is can detect leakage of LPG gas quickly and that will decrease the chance of the accident that occurs due to leakage of LPG gas. This system can be developed quickly and in low cost than the gas leakage detection system available in the market. This system will save the life and their belonging from the incident that happens due to leakage of LPG gas.