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***Research Article** (Open Access)*

AIR QUALITY MONITORING SYSTEM USING myRIO-LabVIEW

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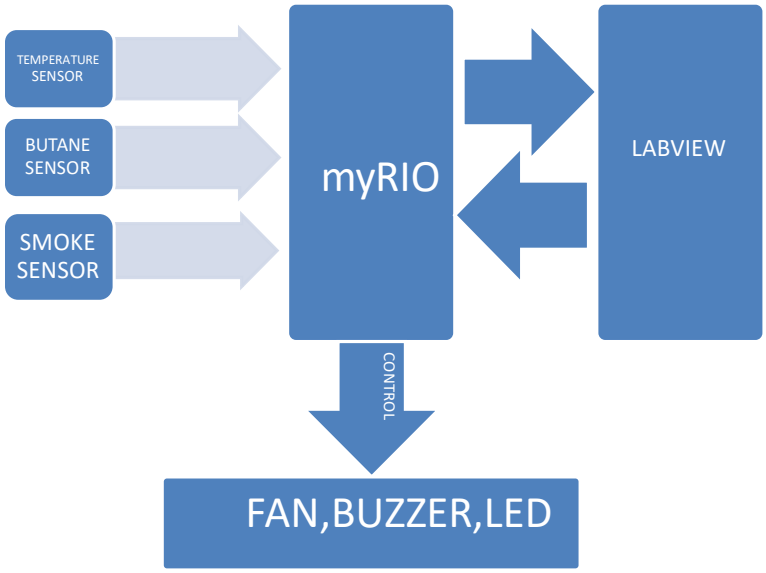
ABSTRACT
Air quality sensors are devices that detect and monitor the presence of hazardous substances like butane, smoke in the surrounding area. This paper covers an experimental analysis of a air quality monitoring system which is used to monitor the temperature, butane and smoke levels in the surroundings. National instruments labVIEW is used as work platform and sensors are interfaced with myRIO-1900**.**

***Key Words:** NI LabVIEW, myRIO-1900, LM35 Sensor, MQ-2 Sensor, MQ-135 Air Quality Sensor*

INTRODUCTION
Nowadays, Air pollution level is extremely increasing beyond the considerable limits. Air pollution is mainly caused by emission from vehicles, gas leakage in factories, household pollution etc. Hence we use air quality sensors to monitor the pollution level. Air quality sensors are devices that detect and monitor the presence of hazardous substances like butane, smoke in the surrounding area. Air quality monitoring is very necessary to make safety precautions. Here we use MQ gas sensors like MQ2, MQ135 for monitoring butane and smoke respectively and temperature is monitored by using LM35 temperature sensor. MQ sensors change its resistance for different concentration of various gases. The change in resistance changes the voltage across the sensor and this voltage can be read by myRIO the designed system (Swain *et al.,* (2017). Smart Industry Pollution Monitoring and Controlling using LabVIEW based IoT" used DTH-11 sensor for temperature measurement . The main disadvantage of that sensor is that it only measures temperature ranges between 0-50 degrees centigrade. In our system we use LM35-temperature sensor. It ranges between -50 to 150 degrees centigrade Mun Ng *et al***.,** **(**2018) tells about the remote monitoring of the conditions of our environment such as air and water.Venkatasreehari *et al***.,** (2014) gives the idea about the proposed technique is to design an efficient system to read and monitor pollution parameters and if any of these factors exceeds the industry standards, immediately these information send to pollution control authority by using LabVIEW methodology. Vimla *et al*.,(2018) tells about the Pollution parameters monitor and control. The work presented in Thummar *et a.,l* (2016)"Development of Pollution Monitoring and Control System Using Lab view " is based on Arduino UNO controller. In our system we use myRIO controller which can provide digital and analog outputs to control output devices like fan, buzzer, LED. The designed system Anupriya *et al*., (2017) "Monitoring of Industrial Process Parameters using LabVIEW" used MQ-6 and MQ-2 for measuring LPG, Smoke respectively In our system, we use MQ-2 for monitoring Butane gas because it is more sensitive to Butane and MQ-135 for measuring smoke. Ramalingam *et al*., (2018) tells about the estimated values of environmental parameters by using the adaptable and smart monitoring systems. Dhoble *et al*., (2018) In this proposed methodology, automatically monitor and control when there is a pollution affecting the environment. Chandni Mariann Thomas and Bijily Rose Varghese (2019) tells about the air pollution monitoring and forecasting system Snehal Sirsikar and Priya Karemore (2015)**.** tells about the development of Pollution Monitoring and Control System Using Lab view Jameco Electronics (November 2000) tells about the some technology which is used for air pollution monitoring and how effective of thesetechnologies are and identify the important research in this important area. Pololu (NO DATE) Hanwei Electronics (NO DATE) Hanwei Electronics (NO DATE) tells about the data sheet of temperature, butane ,smoke sensors respectively. We interfaced LM35, MQ-2 , MQ-135 sensors with

myRIO for monitoring temperature , butane ,smoke respectively. The fan is set to be ON, if the temperature exceeds particular value . LED will glow according to the given limits like safe and hazard. LCD is used to indicate the ppm level of measured gases.

METHODOLGY



The inputs are obtained from sensors like Temperature , butane, smoke sensors and feed these values to the myRIO, which is interfaced with LabVIEW and controls the output devices like fan, buzzer, LED.

SENSOR IDENTIFICATION AND USAGE

1)LM35 TEMPERATURE SENSOR

LM35 Temperature sensor has the range of −55 to +150˚C temperature .As referred from the Wikipedia the Industrial standard value of temperature ranges between −20 ° to 85 °C. In our system, if any fire

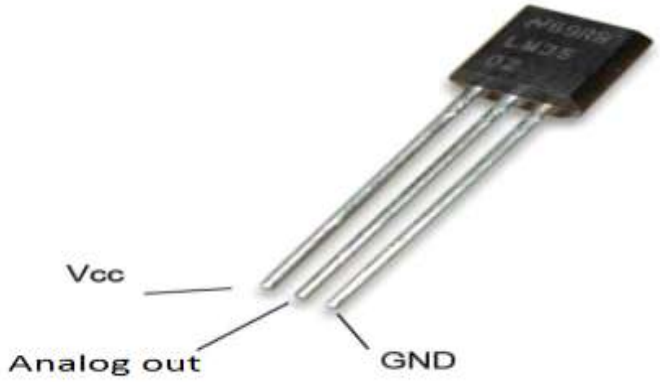


Figure: 1 LM35 Temperature sensor

accident occurs due to the leakage of butane will be identified with the LM35 Temperature sensor.

2) MQ-2 BUTANE SENOR

It has the range between 300 and 10,000 ppm. As referred from [13] has high sensitivity to LPG, Propane and butane. The Sensitive material of MQ-2 gas sensor is SnO2.The ppm range of normal environment is between 250 and 350 ppm and butane ppm is between 1600 and 10,000ppm. The National Advisory Committee for Acute Exposure Guideline Levels for Hazardous Substances (NAC/AEGL Committee) has identified the effect of butane gas. At AEGL level-1 the people are exposed to butane for 10mins at the 10000ppm (parts per million) which causes drowsiness to people. This test was conducted by Patty F.A., Yant W.p; Washington, DC: U.S. Department of Commerce, Bureau of Mines; 1929. The AEGL level - 2 test for butane was studied with guinea pigs exposed to butane for 2hrs at concentrations between 50,000 and 56,000 ppm (Nuckolls 1933). Animals had a "dazed appearance," at the end of the test. The AEGL level -3 test for butane was studied with mice exposed to the concentration of 160,000 ppm it leads mice to dead. Apart from that butane is highly flammable gas and it is very hazard when it is leaked from the industries. butane main uses are in the production of chemicals like ethylene and 1,3-butadiene, as a refrigerant, as an aerosol propellant, as a constituent in liquefied petroleum gas, and as the main component of gas lighter refills. Hence our proposed monitoring system is very essential for these type of industries

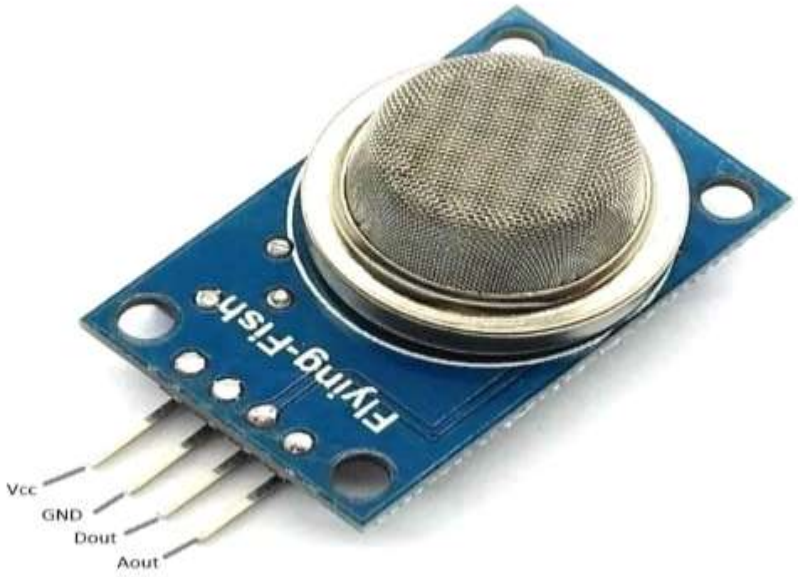


Figure 2: MQ2 Butane sensor

3) MQ-135 AIR QUALITY SENSOR

In our system, it is used to measure the presence of smoke in the surroundings. As referred from [15] smoke above 1700 ppm will cause to immediate death.

Figure 3: MQ135 Air quality sensor

IV.LabVIEW PROGRAM

In our system, the outputs obtained from the sensors are in volts (or) millivolts range. We convert the voltage output into degree Celsius for measuring temperature and ppm (parts per million) for measuring butane and smoke. As referred from the [6], To convert volts to ppm = {x*volts} Where x is the multiplying factor calculated as per the sensor by calibrating it in our own environment. Here we use three conditions namely1) safe, 2) moderate, 3) hazard output ranges according to which control elements like fan, buzzer, LED are used. The output values of temperature, butane and smoke can also be monitored using a LCD.

Table 1: **Different ranges for the sensors outputs**

Parameters	**Safe**	**Moderate**	**Hazard**
Temperature	-20 to 35^{0}C	36 to 85^{0}C	86 to 150^{0}C
Butane	0 to 300 ppm	301 to 10,000 ppm	Above 10,000 ppm
Smoke	0 to 350 ppm	351 to 800 ppm	Above 800 ppm

From the table 1,

1) If temperature is safe, green light glows and when the temperature is hazard, red light glows and the buzzer gets activated and the fan gets ON to reduce the temperature.
2) if the presence of Butane is in safe , the green light glows and when it changes to hazard, red light gets glows and the buzzer gets activated.
3) If the presence of Smoke is in safe, the green light get glows and when it changes to hazard , the red light gets glows and the buzzer gets activated.

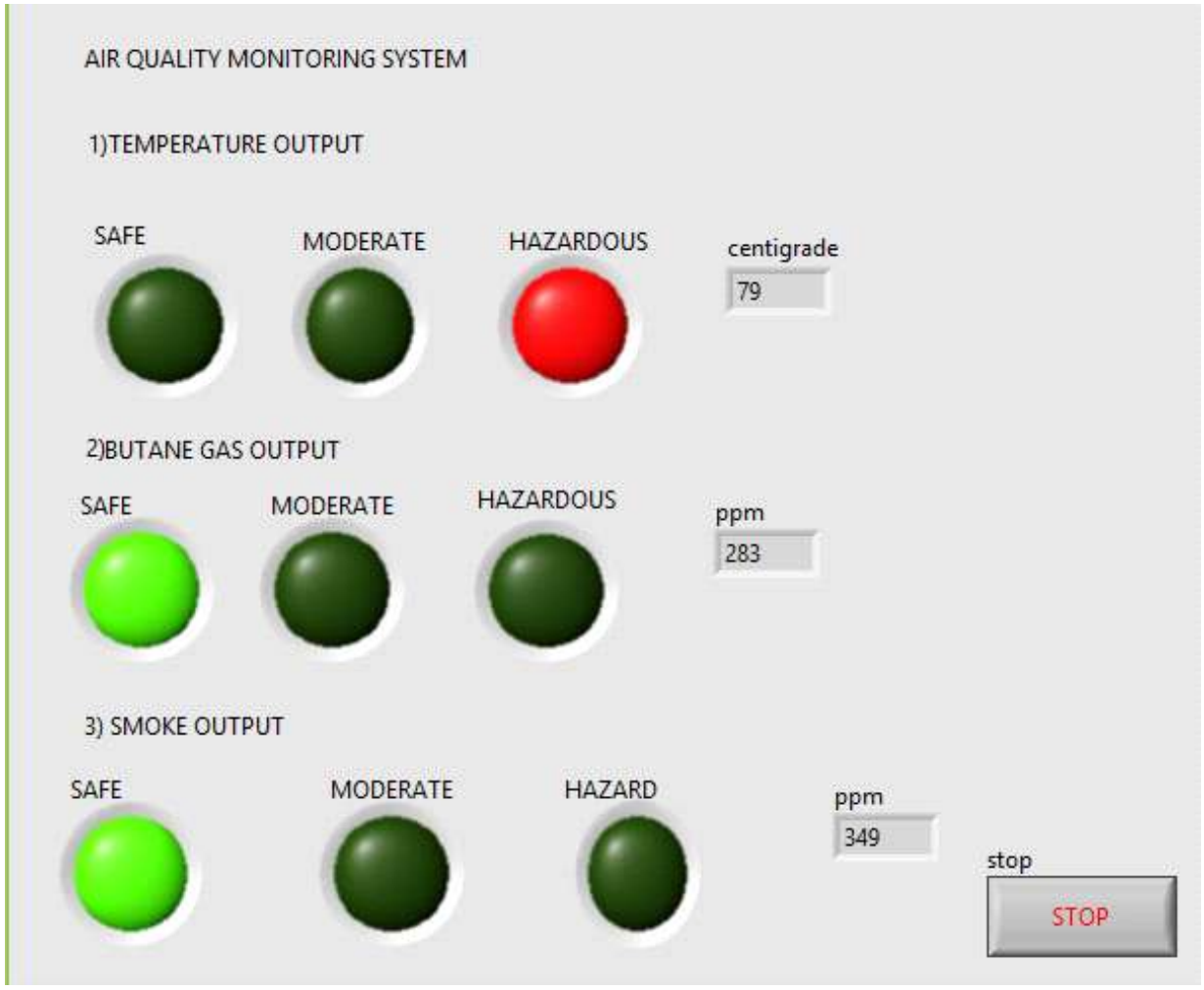


Figure 5: LabVIEW Front panel diagram

V.CONCLUSION

We have developed a system in which parameters like temperature, butane, smoke are monitored. We have set a limit to those parameters . if the values exceed the given limits, then there is an alert. so that we can take safety precautions.

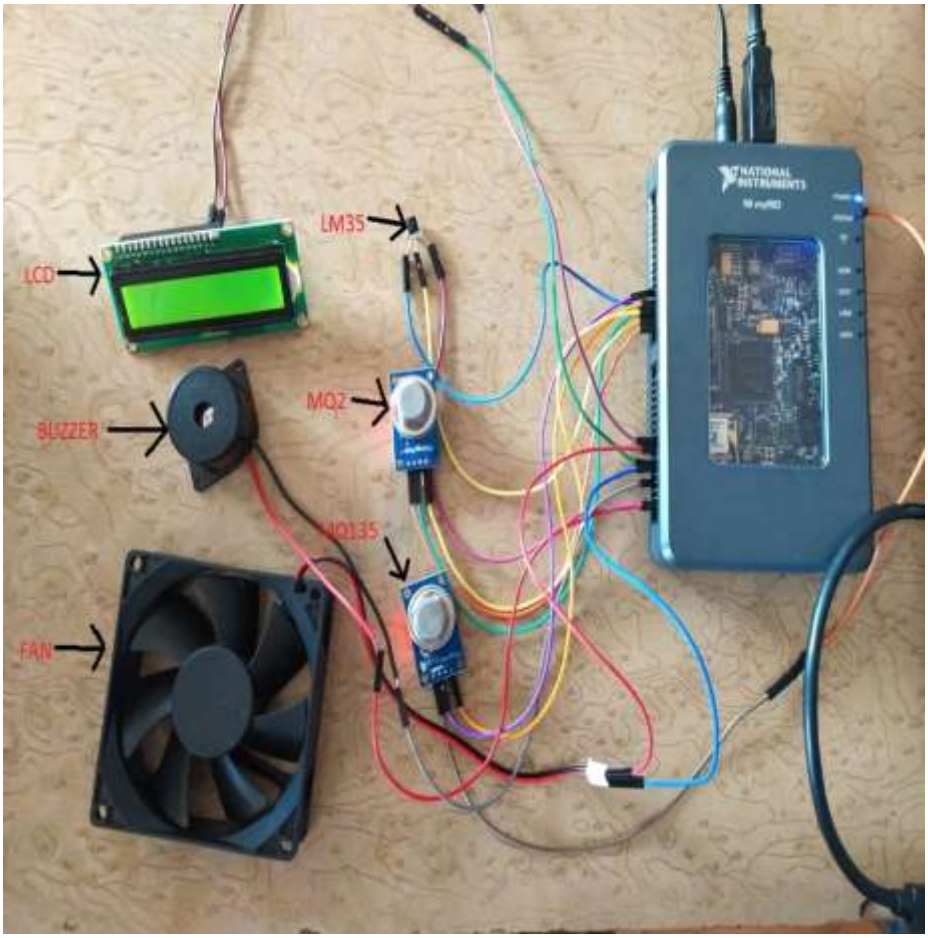


Figure 6: Experimental setup of air quality monitoring system

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