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Industrial Pollution Monitoring using LABVIEWand Arduino

Kishan Dadhania[1], Piyush Gupta[2], Sukarn Pahuja[3]
[1, 2, 3] *Department of Electronics Engineering, Vellore institute of technologyVellore, Tamil Nadu*

***Abstract:** With the increase in the number of industries in the world today, it is important to keep the our environment healthy and no toxic for living creatures. This project concentrates on designing a pollution monitoring system for industries that would be detecting the toxic gases concentration in the atmosphere that is given out by chemical, paper, ammonia, etc producing industries. The system is designed to continuous monitor theconcentration of gases such as LPG, CO, Sulphur, chlorine etc. and warns if increasing level of toxic level of gases are detected. The values of the concentration of gases are logged into the excel file for future reference and perform analysis to understand the pattern of ejecting gases. This project uses Gas sensors and Arduino for detection and transmission of the data to Lab-VIEWsoftware for further process.*
***Index Terms:** Lab view, Gas sensors, monitoring, analysis,safety device*

I. INTRODUCTION

In this growing economy and modern era of globalisation and upcoming industrial 5.0, where industries are must for maximum production, it is necessary for industries like chemical, paper , etc industries to keep pollution levels and toxic and flammable gases in check to prevent any accident ordisasters and also keep track of environment so that it remainshealthy for living creatures around. Many types of poisonous gases—such as sulphur dioxide, chlorine, phosgene, nitrogen dioxide, hydrogen sulphide, and ammonia—may leak into environment in case of any industrial accidents which might lead to many severe irritation in the lungs. Some gases are also being used as chemical warfare agents, for example chlorine and ammonia easily dissolve and within fraction of seconds irritate the mouth, nose, and throat. When this gases are inhaled deeply or for longer time can affect the moreperipheral parts of the lungs. mixing cleanser with bleachas an ingredient with the household ammonia can lead toproduction of irritant gas chloramine which is observed in household.

Some gases—for instance, nitrogen dioxide—do not dissolve easily. Therefore, it is difficult to detect it by human as there is not early signs of warning of exposures like irritation in the nose as well as eyes, and as a result of not being detected early it has high chances to be deeply inhaled into the lungs. These gases can eventually lead to inflammation of the small airways (bronchitis) or fluidaccumulation in the lungs (pulmonary enema).

This paper focuses on detection of gases using gassensors MQ-2 and MQ-9 interface with micro-controller Arduino which is connected to LAB-VIEW through LINX interface. Lab-VIEW is powerful software with uses graphicalprogramming approach that helps to visualize every aspect application, including hardware configuration, measurement data, and debugging. This visualization that LAB-VIEW offers makes that task of integration of measurement hardwarefrom different vendors, can represent complex logic on the diagram, develop data analysis algorithms, and design custom engineering user interfaces.

LIFA software is used to connect hardware sensors and Arduino with Lab-VIEW software. LINX is the successor of LIFA, but it is a complete new toolkit which is built from scratch. LINX is designed to be a more generic hardwareabstraction layer for embedded devices for example chipKIT, Arduino, my-RIO, etc, rather than designed for one specific micro-controller platform. This means that LINX providesthe infrastructure to add support virtually for any device. In addition LINX provides many improvements over LIFA such as better error handling, more sensor support, Ethernet and WiFi support. LINX helps to removes the need to build the firmware from source by providing a wizard interface with pre-compiled firmware.

II. EXPERIMENTATION AND METHODOLOGY

For this project we use MQ2 and MQ9 gas sensors to measure smoke, combustible gas and carbon monoxide.MQ-2 gas sensor has high sensitivity to LPG, Propane and Hydrogen,also could be used to Methane and other combustible steam,it is with low cost and suitable for different application. MQ-9gas sensor has high sensitivity to Carbon Monoxide, Methane and LPG.

The sensor could be used to detect different gases contains CO and combustible gases, it is with low cost and suitable for different application. There is a network of gas sensors which is connected to the Arduino and to get the necessary output and the complete analysis of the concentration level of the gases we use LAB-VIEW.

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Arduino-UNO is interfaced with LAB-VIEW using the LINX software. The output of the Arduino is communicated to the LAB-VIEW with the help of LINX software.

As the data of the gas sensor get logged into the software,it controls and monitors the concentration of different gases. Itwill react by alerting when concentration of gases goes beyond the safe level. Beside this the data is being recorded and saved for future reference and analysis.

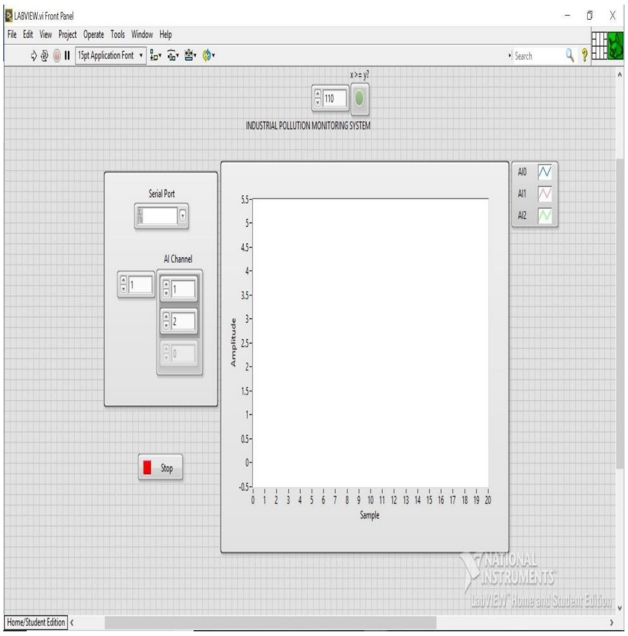


Figure 1 - Front panel of VI

The above fig-1 depicts the front panel of virtual instru- ment(VI) in LAB view software. There are different channels created for different gases, and their graph is sketched in different color. On the top we can see a threshold being set. whenever the concentration of gas exceeds the pre-set value, the system send an alert.

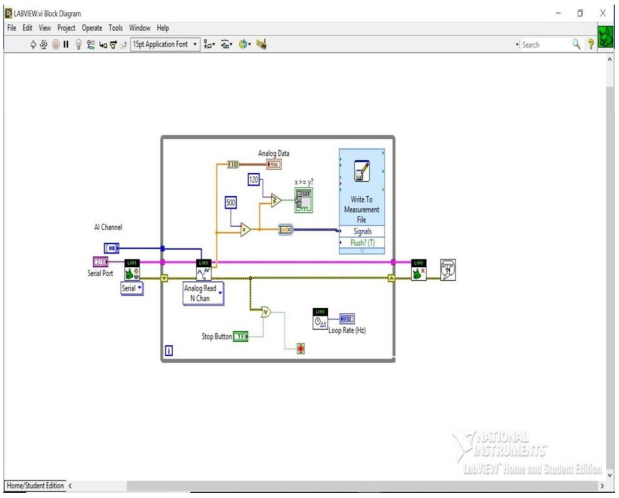


Figure 2 - Block Diagram of VI

The above fig-2 represent the connection of different com- ponents. The sensors are connected to the serial port through which data enters the VI. The values are read and then amplified according to the their sensitivity to convert the reading in standard measuring unit. After that it is comparedto the threshold, if greater than threshold alarm get triggered.If reading is in safe range then it gets logged in the excel file.

This keeps on running in a infinite loop until the stop buttonis pressed.

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III. RESULTS AND DISCUSSION

As a result of implementing this system, fatal accident could now be avoided and several lives can be saved. Withthe help of this automated safety monitoring system chancesof human error and negligence will be reduced significantly.

The graph of the output of both the sensors (MQ2 andMQ9) are displayed in the output on the front panel.

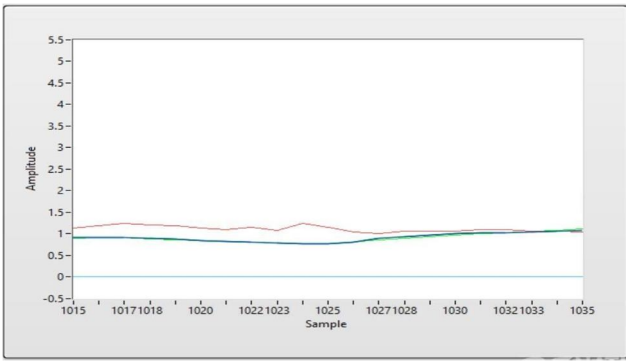


Figure 3 - Output of MQ2 and MQ9 sensor

The values of the concentration in ppm are displayed in excel sheet.

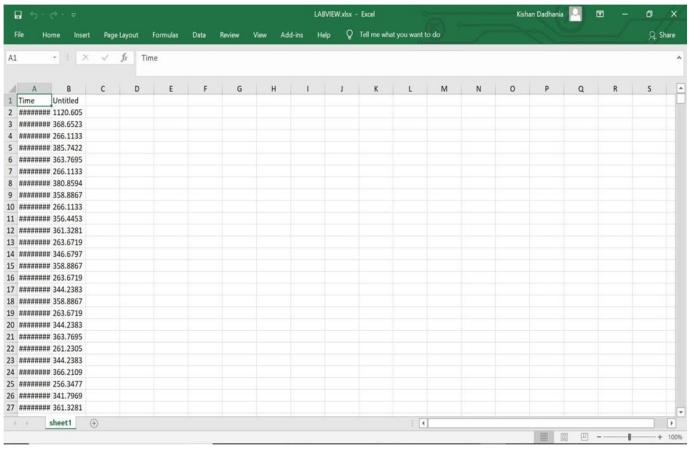


Figure 4 - Value of concentration in ppm

IV. CONCLUSION AND RECOMMENDATION

A. The gas sensor was appropriately connected to Arduino which was successfully interfaced with ARDUINO and required graph and values were obtained .

B. The project could have been better and more organizedif used a led light to indicate that the gas concentration has went above the threshold.

C. We could have also used a buzzer as an alarm for the indication.

D. Instead of breadboard we should have used a PCB whichis more convenient to use and errors will decrease

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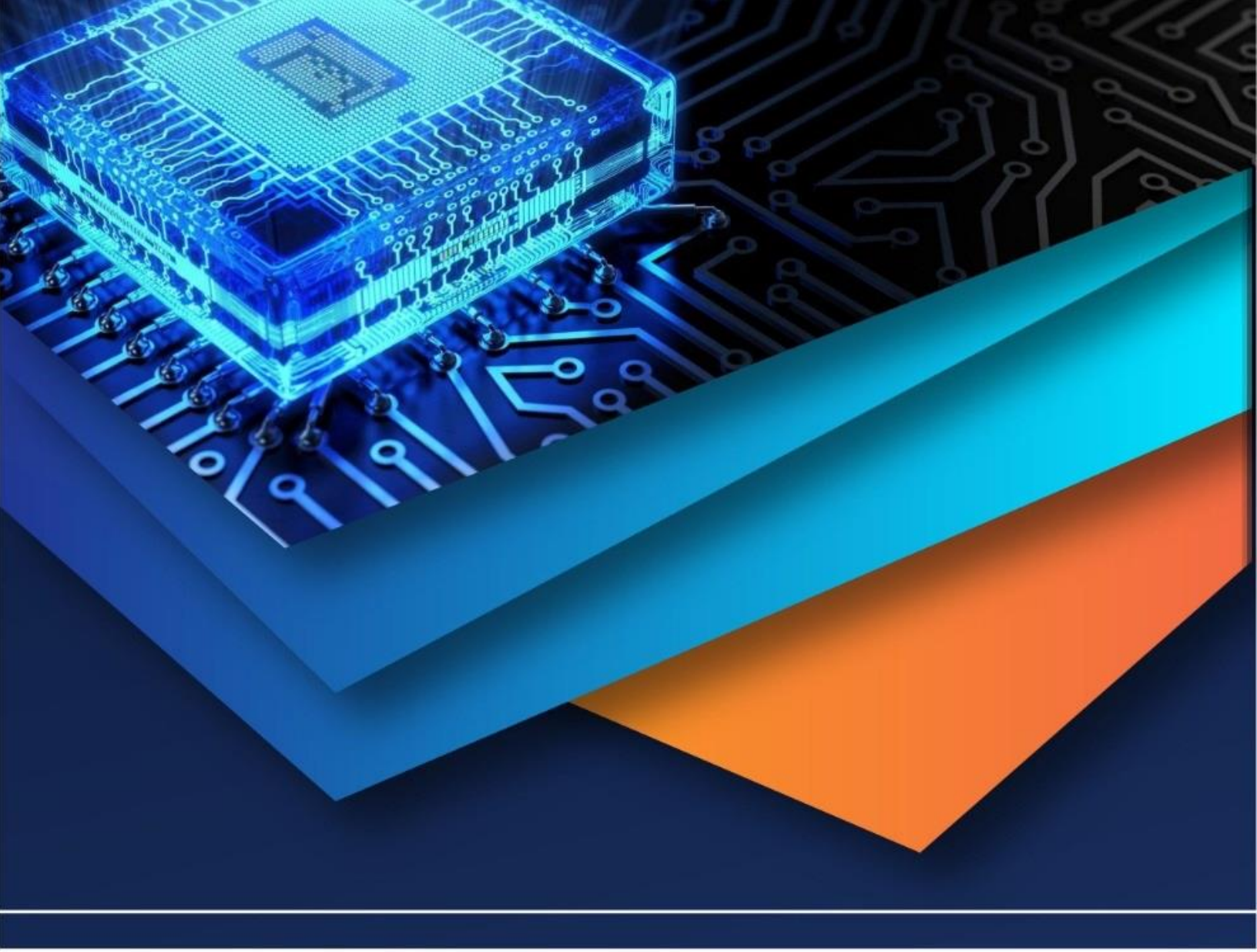
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