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Air Pollution Monitoring and Decision Making Using MyRIO

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ABSTRACT: Air quality is closely linked to the earth's climate and ecosystems globally. Many of the drivers of air pollution (i.e. combustion of fossil fuels) are also sources of greenhouse gas emissions. Air pollution is a significant risk factor for a number of pollution-related diseases, including respiratory infections, heart disease, COPD, stroke and lung cancer. The solutions to this pressing issue are also the key to tackle the climate crisis, fostering inclusive societies and improving childhood development. By working together, we have a golden opportunity to transform our approach to one of the great hidden killers. But the first step is to know, what are the causes? According to the survey, about 50% of the diseases are caused by the pollutants in the air. Our project focuses on air quality monitoring based on myRIO-LabVIEW and descision making, which could monitor the quality of air via detection of Carbon Monoxide (CO), hazardous gas like smoke, benzene, vapours rate in indoor locations within buildings. The sensors used to detect these gases are MQ-7, MQ-9 and MQ135. It is connected to the Arduino Uno and MyRIO controllers; the outputs are processed by the LabVIEW software on the user computer remotely and the gas with the highest rate will be displayed in the LCD display along with the cause and effect. MyRIO will continuously save the gas rates data when the substance exists around these locations. In this way, the LabVIEW can process and display the data to the user wirelessly or remotely. Subsequently, the average rate could also be calculated. The system is very useful and can be used in the further days.

KEYWORDS: myRio-LabVIEW, MQ-7, MQ-9, MQ-135, Arduino Uno, decision making

I. INTRODUCTION

People around the world have started to think about themselves and the surrounding. The five essentials of nature are air, water, land, sky, fire. Among these five, the air comes first. The air we breathe is very essential. It is very important for that air to be clean. Diseases such as asthma, lung cancer and emphysema can actually be caused by polluted air. These diseases brought adverse effects in the lives of human beings. In the modern world, back and then, it is always a concern that everyone is healthy and have an eternal life. In fact, in the past two years the concern has turned out to be more because of the Covid losses. Air pollution also has negative effects on the environment as it can cause greenhouse effects and contributes to global warming. Air pollution is contributed mostly by the combustions of fuel, open burnings, gases emission from industrial site and smoking. To monitor the air quality that we inhaled is very important in order to ensure the best air quality is there for us. Not only do air pollutants and greenhouse gases share the same sources, some pollutants directly contribute to global warming. Reducing these pollutants (called Short-Lived Climate Pollutants) would slow the rate of climate change and help limit warming to 1.5C. Even though you can't see it, the air you are breathing is probably polluted.Monitoring is an exercise to measure ambient air pollution levels in an area. The data will indicate the status of the quality of air we breathe. It will be much more better if we get to know the effect the cause of the gas.

Some of the current approach to remotely monitor the air quality is by using the integration of sensor, Arduino microcontroller and Global System for Mobile (GSM) module. Moreover, some wireless system is using the General Packet Radio Service (GPRS) sensors array and a wireless sensor for real time monitoring which has been designed, implemented and tested. There are also a system that is mobile by using Sharp GP2Y1010AU0F optical dust sensor, Arduino Uno and Liquid Crystal Display Keypad Shield in order to monitor the Air Pollutant Index (API). Asystem was developed that uses GPS and smart phone to pinpoint coordinate along with air pollution readings. In addition to this, there are some of the past system that uses different type of sensor such as the TGS2600 and several customize

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applications such as mobile sensing box and personal sensing device. In recent years, the implementations of remote monitoring using LabVIEW have been implemented on various areas.

The LabVIEW and the MyRIO can be used to monitor various physical parameters remotely and it can be used as a small scale portable detection system where data could be remotely viewed by the user. Subsequently, the data logged can be automatically saved into Microsoft Excel for further analysis. As of now, the project we have focused to remotely access the sir quality within buildings by developing a system based on MyRIO-LABVIEW.

II. LITERATURE REVIEW

The air pollution monitoring itself does not reduce air pollution, it gives us clues on how much is the pollution, where is the pollution, and when is that pollution. Worldwide, 9 out of 10 of us breathe air that is damaging our health. Invisible particles penetrate every cell and organ in our bodies, causing acute and chronic diseases, including asthma, strokes, heart attacks and dementia. Outdoor air pollution causes around 4.2 million early deaths every year. Our children, and all future generations, deserve to breathe air that is free from toxic pollution. 93% of children under 15 are denied their right to grow up in a clean and healthy environment. Many babies breathe polluted air from their first breath, a critical period when the foundations of growth and cognitive development are being established. Air pollution negatively impacts a child's physical health, their right to an education and to play. These factors are detrimental to brain development, and contribute to mental health and behavioral issues.

In each organization or company the employer must ensure the best environment for the workers to produce good quality of work. The air quality of the area surrounding the companies is one of the important aspects to be taken care of for the sake of the employees' health. Hence, it is essential to implement air quality monitoring as it will assists the user or the community to ensure good air quality around them. Furthermore, this will also help to reduce the effects of air pollution that have been one of the primary types of pollution. It would be much more efficient if that air could be monitored using the modern technology via both software and hardware.

The aim of this project is to monitor the air quality within buildings by developing a system based on MyRIO-LABVIEW and display the effect and cause of the gas that is more in the location. The substance that will be examined in this project is the CO, Ozone gas and strong oxide like C12,NO2 etc, also the hazardous gas like smoke, benzene, vapors rate. The hardware of this project will use the MyRIO controller, Arduino Uno and the MQ-7 gas sensor, MQ-9 sensor and MQ-135 sensor. The software that will be used in this project is LabVIEW. The gas sensor will detect the gas level in the air and LABVIEW will save the data to the local file. Subsequently, the user could get the data from the local file by accessing the folder inside the MyRIO. All of this will be done wirelessly or remotely. Then the gas that is highest in the location will be displayed in the LCD display along with the effect and cause of the gas. By this way, the sensing device could be made portable as it can be placed at any location. The data can be accessed with ease as data can be examined easily by the user at a remote location within the building.

III. CASE STUDY

The motive of our project was first based on the major cause of the air pollutant in the atmosphere. A study was made, were we concluded that, nearly 50% of the diseases are caused due to the pollutants in the atmosphere. The major reason behind these problems is there is no proper awareness and the public doesn't know the effect and the cause of the gas. Air pollution may cause specific genetic or epigenetic abnormalities and lead to the development of uterine fibroids (UFs). Uterine fibroids (UFs), the benign tumors and generally known as uterine leiomyoma, are the most frequently occurring tumors and neoplasms of the reproductive tract in women. In the days back,in Taiwan, examined that the association of menstrual cycle characteristics with UFs in women and reported that UFs commonly occurred in reproductive-aged women with the incidence approximately up to 60%.This was leading to cancer or premalignant conditions (22.2%), pelvic relaxation (12.6%) and endometriosis (9.9%). It is hard to know that in 2004. This was the case only in Taiwan, but now in the present, this is a hazardous disease in most of the countries including India. About 40% of the women are admitted in the hospital for this one cause. Young girls are suffering from uterus cancer. Air pollution may play an important role in environmental problems around the world. Mounting epidemiologic studies showed significant associations between air pollution and numerous women's health problems. We personally wanted to survey the amount of hazardous air in the atmosphere and it was shocking to know that CO and NO2 was more in percentage. For this reason, we started the initiative to monitor the air and give a report on the percentage of harmful gases in the atmosphere. This could be an awareness for the people to understand that the air we breathe are really harmful or not and know the causes.

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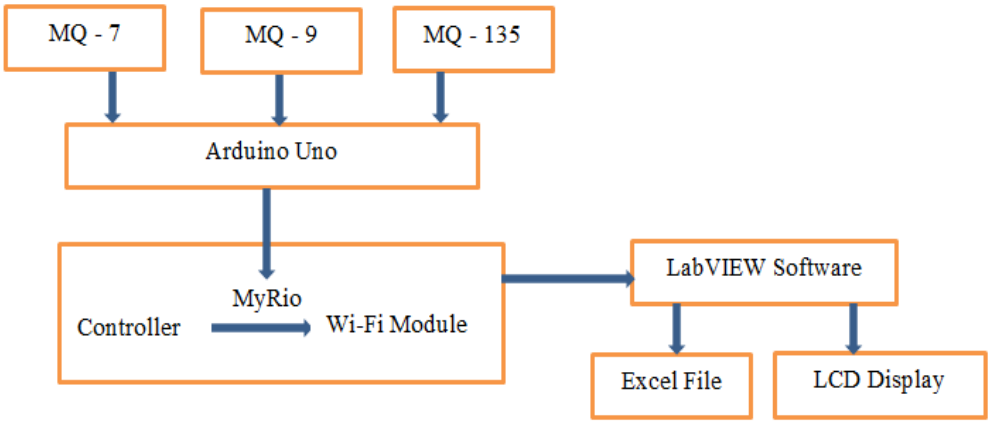
IV. EXPERIMENTAL PROCESS



The system has got three sensors, MQ-7, MQ-9 and MQ-135. The system detects the Carbon Monoxide (CO) gas in the area by means of the MQ-7 gas sensor that is specifically used to detect the CO gas. The MQ-9 sensor has high sensitivity to Carbon Monoxide, Methane and LPG. The sensor could be used to detect different gases contains CO and combustible gas; it is with low cost and suitable for different application. Similarly, the MQ-135 sensor can be implemented to detect smoke, benzene, vapors, and other hazardous gases. It can detect various harmful gases. It can be used for air quality monitoring, noxious gas detection, home air pollution detection, industrial pollution detection, portable air pollution detection, etc. These sensors are attached to a customized module that has its own circuit. The module is then connected to the Arduino Uno. The coding in the Arduino Uno activates the sensor for it to produce the gas readings in parts per million (ppm). On the other hand, the Arduino Uno is interfaced with the MyRIO 1900 by using Universal Asynchronous Receiver/Transmitter (UART) so that the data can be accessed by the LabVIEW software. The wireless module in the MyRIO is acting like a router in order that it could be accessed wirelessly and remotely by the user computer. The readings can be monitored by the user wirelessly via the LabVIEW Graphical User Interface (GUI) (Fig. 2) and is automatically saved into the Microsoft Excel. Then the LCD will display the gas with the highest rate from the waveform chart in LabVIEW and also display the cause and the effect of the gas.

This remote air quality monitoring system operates in the LabVIEW environment. The GUI functions can be developed by the user in the LabVIEW block diagram window. Here, the LabVIEW GUI functions is developed using functional block diagram. LabVIEW based GUI is used mostly in the industry for displaying data and real time monitoring and could create an awareness to the public that what will be the severe causes of the gas.

V. CONCLUSION

The air quality monitoring system using the MyRIO and LabVIEW could be considered as a successful process. The system is fully portable and functional. The access to the Microsoft Excel file that contains the data can be done remotely at the user computer. This system can be implemented at a workplace as well as at home. All the data collected can be used for future references by the relevant parties for further actions. The current system can be enhanced by adding several other types of gas sensors such as MQ-6 to detect butane gas, MQ-8 for hydrogen gas and MQ-131 to detect ozone gas. When there is the access to the technology that could prevent us from the harm and keep everyone happy, why not to execute it? This is the motive behind this project.

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VI. RESULT AND DISCUSSION

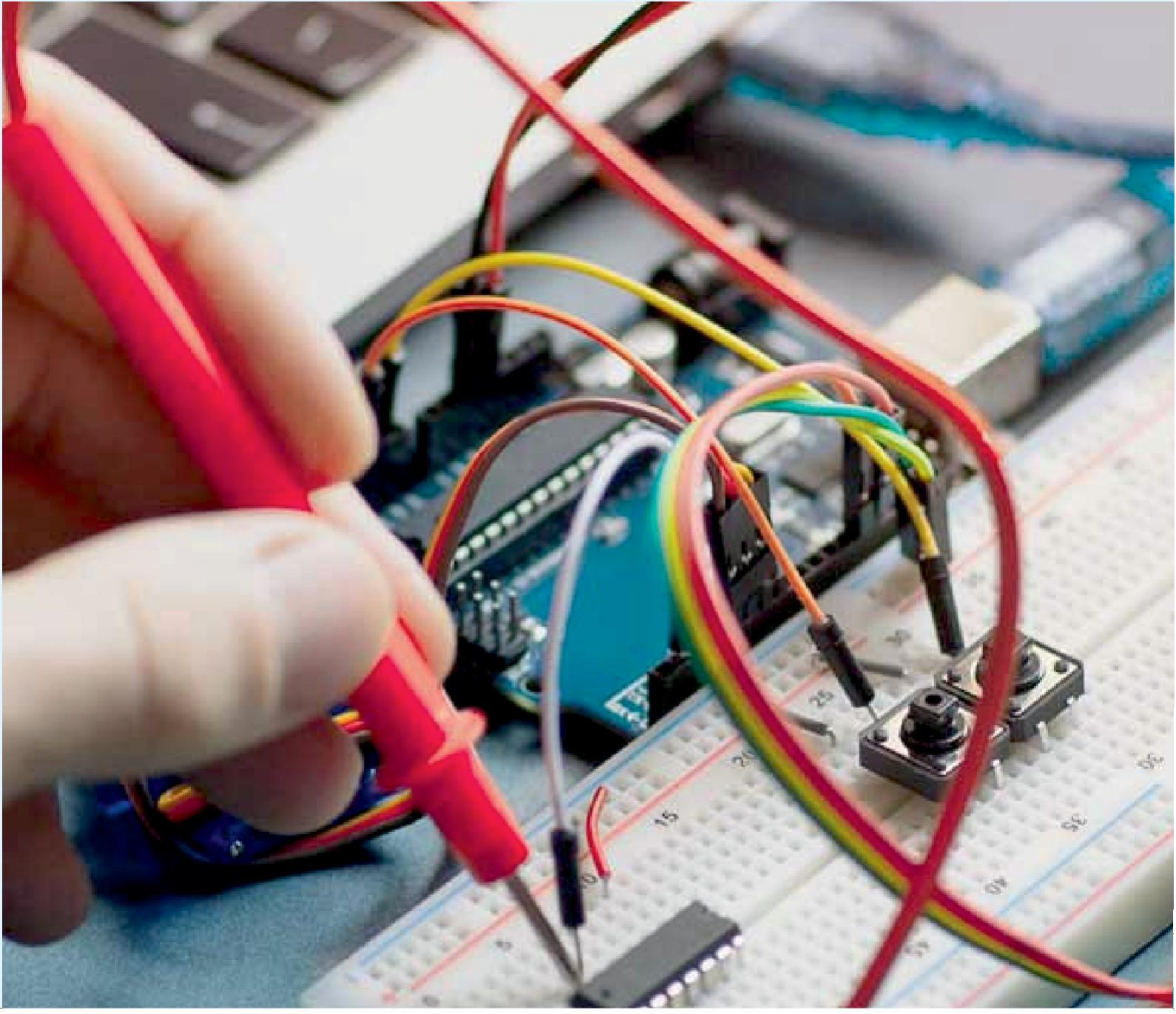
TABLE 1. CO concentration level and effects towards

CO CONCENTRATION IN AIR	INHALATION TIME AND SYMPTOMS
9 ppm	ASHRAE maximum allowable concentration for short exposure in a living area.
50 ppm	Maximum allowable concentration for continuous exposure in any 8-hour period.
200 ppm	Headache, tiredness, dizziness and nausea after 2 to 3 hours.
400 ppm	Frontal headache within 1 to 2 hours and life threatening after 3 hours. Maximum allowable amount (air-free) in flue gases.
800 ppm	Dizziness, nausea and convulsions within 45 minutes. Unconsciousness within 2 hours. Death within 2 to 3 hours.
1,600 ppm	Headache, dizziness and nausea within 20 minutes. Death within 1 hour.
3,200 ppm	Headache, dizziness and nausea within 5 to 10 minutes. Death within 30 minutes.
6,400 ppm	Headache, dizziness and nausea within 1 to 2 minutes. Death within 10 to 15 minutes.
12,800 ppm	Death within 1 to 3 minutes.

Depicts the effect of different CO concentration ranges on human health [11]. The maximum permitted concentration of CO gas continuously in a maximum 8-hour period is listed row 2 of Table 1. However, the average concentration at level 14 is 71.99 ppm, which is concerning given that students and teachers spend more than 8 hours a day at the faculty. This circumstance may have a negative impact on their health and work productivity. The same thing happens in the fast food restaurant, where the average ppm level is 64.93. This demonstrated that the region was not as clean as it appeared to be. Persons in the nearby region may be impacted if the area remains silent.

REFERENCES

[1] Srinivasan Devarakonda, Parveen Sevusu, Hongz Hang Liu, Ruilin Liu, Liviu Iftode, Badri Nath Urbcomp‟ Real-Time Air Quality Monitoring Through Mobile Sensing In Metropolitan Areas‟13, August 2017 Acm.
[2] Fouzi Harrou, Mohamed Nounou,Hazem Nounou “Detecting Abnormal Ozone Levels Using Pca Based Glr Hypothesis Testing”2017 Ieee Symposium On Computational Intelligence And Data Mining.
[3] Elias Yaacoub,Abdullah Kadri,Mohammad Mushtaha,And Adman AbuDayya,”Air Quality Monitoring And Analysis In Qatar Using A Wireless Sensor Network Deployment”596-601,2019 IEEE.
[4] Parr, T. W., Ferretti, M., Simpson, I. C., Forsius, M., & Kovács-Láng, E.Towards a long-term integrated monitoring programme in Europe: network design in theory and practice. Environmental monitoring and assessment, 78(3), 253-290.
[5] Jerrett, M., Arain, A., Kanaroglou, P., Beckerman, B., Potoglou, D., Sahsuvaroglu, T., ... & Giovis, C. A review and evaluation of intraurban air pollution exposure models. Journal of Exposure Science and Environmental Epidemiology, 15(2), 185.
[6]S. Kumar and A. Jasuja. Air quality monitoring system based on internet of things using raspberry pi. Pages 1341-1346, May 2017.
[7]S.R. Enigella and H. Shahnasser. Real-time air quality monitoring. Pages 182-185, Jan 2018.
[8]D. Wang, C. Jiang, and Y. Dan. Design of air quality monitoring system based on the internet of things. Pages 418-423, Dec 2016.
[9]L. Peng, F. Danni, J. Shengqian, and W. Mingjie. A movable indoor air quality monitoring system. Pages 126-129, July 2017.
[10]Sumanth Reddy Enigella, Hamid Shahnasser. "Real-Time Air Quality Monitoring", 2018 10th International Conference on Knowledge and Smart Technology (KST), 2018.



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