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A Cloud Based Industrial Automation using Edge Devices

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ABSTRACT

The growth of industries and other human activities have led to ever increasing amounts of pollutants in both outdoor and indoor spaces. These pollutants have hazardous effects on humans and the wider ecology. Hence, air quality monitoring (AQM) is essential and involves the robust monitoring of various toxic gases and volatile organic compounds (VOCs)—in case, the concentration of any pollutant exceeds the safe limit in a given location. This paper describes the different sources of indoor and outdoor pollutants, reviews the current status of gas sensors, and discusses the role of new two dimensional (2-D) materials in detecting these hazardous gases at low power, i.e., close to the ambient temperature. Here, we review different synthesis techniques of 2-D materials and discuss the sensing performances of pristine and functionalized nanomaterials for some of the important pollutants such as NOx, NH3, SOx, CO, formaldehyde, toluene, and so on. The review concludes with some proposed methods to help in reducing air pollution today.

KEYWORDS: *volatile organic compounds, Internal outputs*

INTRODUCTION

There has been an increasing interest to develop the new low-cost and low-power gas sensors for various application-specific areas. This includes air pollution monitoring of both indoor and outdoor spaces, detection of toxic gases in and near industrial premises and also sensors for biomedical applications [1]. In recent years, there has been a rapid rise in levels of toxic gases and volatile organic compounds (VOCs) in air, particularly in urban spaces. This is mostly true for many cities in under-developed or developing countries. For example, a recent report from the World Health Organization (WHO) in 2018 shows that 15 Indian cities and 21 Chinese cities are amongst the 50 most polluted cities in the world [2]. In 2019, air pollution is considered as the greatest environmental risk to health [3]. The major sources of polluted air are fuelwood and biomass burning, burning of large-scale crop residue, fuel adulteration, uncontrolled emission from vehicles and factories, traffic congestion, and rapid construction[4]. These sources cause smog and, hence, increase the airborne particulate matter (e.g., PM10, PM2.5), NOx , NH3 , SOx , CO, and other VOCs in the air. All these pollutants are well in excess of the human permissible limit in capital cities like Delhi (sixth in WHO list), Kampala (16th in WHO list),Doha (21st in WHO list), Kabul (28th in WHO list), and so on [2]. The quality of indoor air is of equal as that of outdoor air We spend most of our time indoor and indoor pollution can be many times the level of outdoor pollution! Smart buildings (e.g., houses, hospitals, schools at smart cities in developed countries) are such places where different hazardous gases and VOCs such as

CO2, CO, formaldehyde, benzene, toluene, ethylbenzene, and xylene (popularly known as BTEX) along with humidity are monitored and restricted to permissible limit through proper detection and ventilation [5]. However, there is a lack of awareness and a detailed understanding of the long-term acute effect of these air pollutants among populations. Excessive exposure of air pollutants leads to increase in respiratory and cardiovascular diseases, such as acute lower respiratory infections (ALRIs), chronic obstructive pulmonary disease (COPD), lung cancer, ischemic heart disease (IHD), pneumonia, and strokes [6], [7]. Thus, air pollution is the reason behind many diseases that are proven to be fatal. Globally, almost 7 million deaths were caused by household and outdoor pollution in 2016 [2], the fourth-highest cause of deaths worldwide. This makes air quality monitoring (AQM) an urgent and essential assessment. Many review papers have been published on metal oxide based resistive sensors for detecting toxic gases over the years [8]–[1]. There are many reports published on air pollution either [4], [1]. Recently, several review papers highlighted 2-D layered material based resistive sensors [12]–[5].

However, the authors believe that it is necessary and of utmost important to review the sources of air pollution, status of resistive sensors available in the market for detecting toxic gases, highlighting the necessity to develop near-room temperature resistive sensor(which will reduce the power consumption drastically and fetch the way for things in the Internet), different ways of synthesizing/functionalizing 2-D nanomaterials, their performances to detect different pollutants, and possible approaches to tackle with the air pollution.

BLOCK DIAGRAM

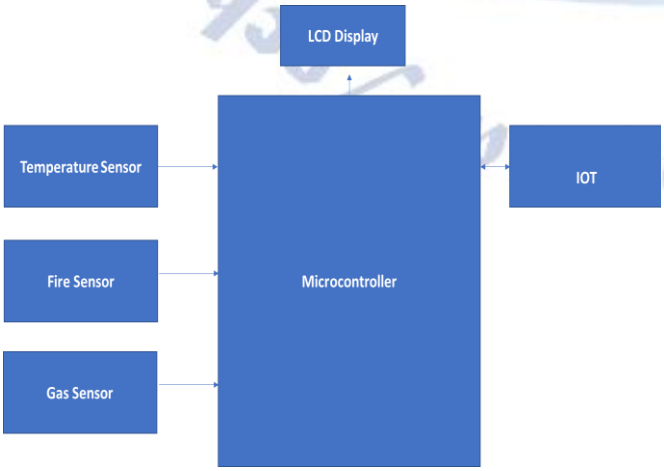


Fig: Proposed Block Diagram

EXISTING SYSTEM

A. Air pollution is a growing issue these days. It is necessary to monitor air quality and keep it under control for a better future and healthy living for all.
B. Here system propose an air quality as well as sound pollution monitoring system that allows us to monitor and check live air quality as well as sound pollution in particular areas.

PROPOSED SYSTEM

This system is made to fulfill the purpose and need of the society to monitor and check the live air quality and sound pollution in an area through IOT. The system uses air sensors to check the presence of harmful and hazardous gases/ compounds [such as Methane,propane, Butane, alcohol, noxious gases, carbon monoxide etc.] in the air and also uses the sound sensor to keep measuring sound level in the surroundings. MQ2 is the air sensors which are used to collect air pollutants and a sound sensor module mic is used to capture sound. These sensors interact with Arduino which processes this data and then transmit it over the mobile application. To send the data over remote location WIFI modem is also installed. And whenever the air pollution is detected, a buzzer immediately beeps and when there is a noise pollution an LED starts blinking continuously. With this system not only the authorities but also the localized people can check the transmitted data through their mobile phone and that too without spending single penny and thepeople can act against it on their level and try to bring the pollution level under control. This system would contribute as a part in the building of a healthy society POWER Already some digital devices installed over in the ambulance. Hence the power for this project can be supplied from that. Since majority of the devices used in this project are less power consumption modules there will not be any need for additional significant investment for power. COST cost is only for the sensors module since development and communication are more and user friendly. If there is problem in the connections it can be made identified through alarms, with basic electrical knowledge itself. Need for trained professional is not necessary. FUNCTIONALITY Protect and speed medium where the information can be paased and gained at any place.

MODULES DESCRIPTION

A module is a software component or part of a program that contain one or more routines. One or more independently developed modules make up a program. The project "SMART FACTORY BY USING IOT" consists of two main modules they are, Hardware & Software.

INPUT DESIGN

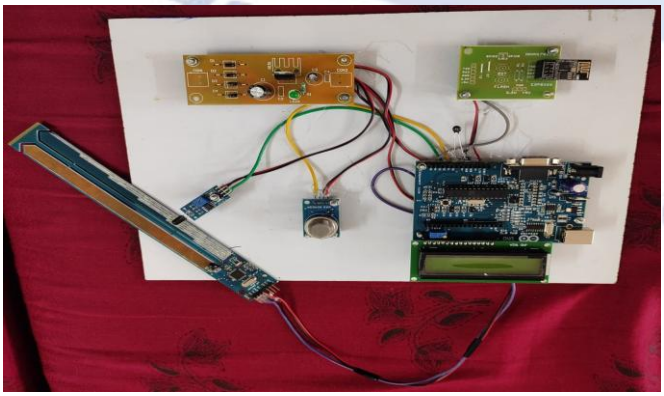
Input design is one of the most expensive phases of the operation of computerized system and is often the major problem of a system. A large problems with the system can usually be traced back to fault input design and method. Needless to say, therefore that the input data is the life block of a system and has to be analysed and designed with the most consideration.

The decisions made during the input design are:

- To provide cost effective method of input.
- To achieve the highest possible level of accuracy.
- To ensure that input is understood by the user.

System analysts decide the following input design details like, what data item to input, what medium to use, how the data should be arranged or coded data items and transaction needing validations to detect errors and at last the dialogue to guide users in providing input. Input data of a system may not be necessarily a raw data captured in the system form scratch. These can also be the output of another system or sub-system. The design of input covers all phases of input from the certain of initial data to actual entering the data to the system for processing.

HARDWARE SCREENSHOT



OUTPUT DESIGN

Output design generally refers to the results and information that are generated by the system. For many end-users, output is the main reason for developing the system and the basis on which they evaluate the usefulness of the application.

The objective of a system finds its shape in terms of output. The analysis of the objective of a system leads to determination of outputs. Outputs of a system can take various forms. The most common are reports, screens displays printed form, graphical drawing etc. the outputs vary in terms of their contents, frequency, timing and format. The users of the output, its purpose and sequence of details to be printed are all considered. When designing output, the system analyst must accomplish things like, to determine what information to be present, to decide whether to display or print the information and select the output medium to distribute the output to intended recipients.

Internal outputs are those, whose destination is within the organization. It is to be carefully designed, as they are the user's main interface with the system. Interactive outputs are those, which the user uses in communication directly with the computer.

IOT OUTPUT SCREEN SHOT

SCREEN SHOTS

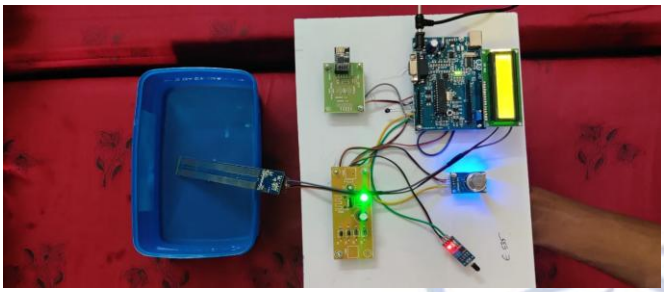


Fig: represents PHP, here we are measuring the PHP level of water.

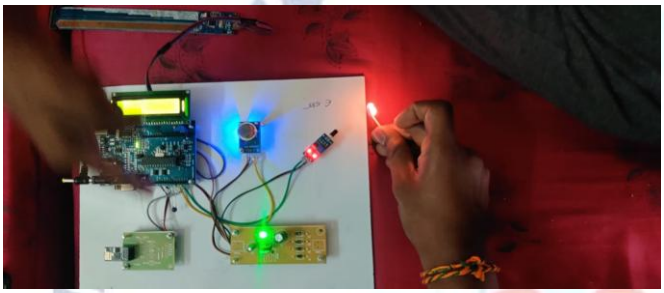


Fig: represents fire sensor, here we are detecting the fire.

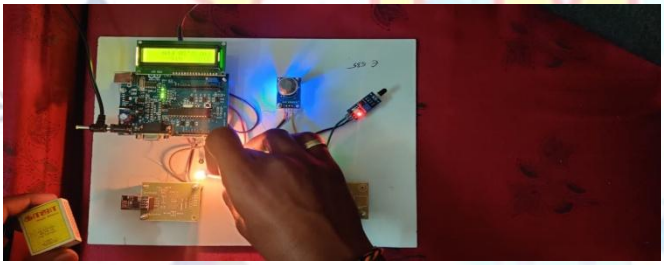


Fig: represents temperature sensor, here we are detecting the temperature.

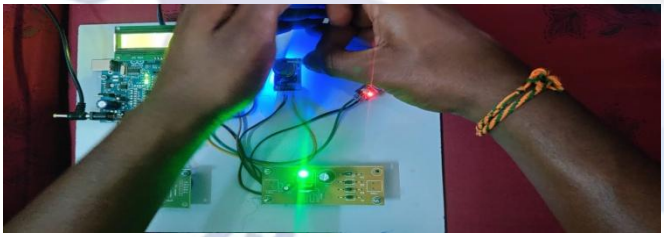


Fig: represents gas sensor, here we are detecting the gas level.

CONCLUSION AND FUTURE WORK

Our project describes the different sources of indoor and outdoor pollutants and the methods in which these pollutants can be detected presently. This study reviewed different synthesis techniques of new 2-D layered materials for gas sensor applications, the study that has been carried out so far on gas sensors based on intrinsic 2-D materials and explained the limitations of such 2-D gas sensors. The advantages of functionalization of carbon nanomaterials and TMDs are also presented. Different ways of functionalizing these sensing layers are described and the performances of different composite sensors reported so far are presented. The final section of this review discussed some of the possible ways to minimize air pollution. It is believed that more focused study in developing gas sensors based on these new 2-D materials could lead to the development of much more efficient AQM systems, which can reduce the 7 million deaths annually associated with polluted air as well as improve well-being for less polluted spaces.

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