Design & Development of Electronic Nose for Explosive Chemical Detection

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Abstract

Rise in accidents pertaining to leakages in chemical plants have given rise to an urgent need for a more accurate and cost effective method of detection and avoidance. Use of electronic nose for detection of toxic chemicals provides an effective solution due to its ability to monitor crucial data and note irregularities. An efficient method of data management provides precise information to predict and avoid catastrophes. The main objectives of this work is to design an Air Quality monitoring system to check humidity, temperature, altitude and pressure levels along with detection of the presence of explosive chemicals. It measures the concentration of the various gases in the environment/surrounding and make it a feasible solution in the industrial scenario. Equip the user with a graphical user interface to display the concentration of gases and to notify the concerned authorities on crossing the predetermined levels. The developed prototype can be mounted near the area of potential leakages or at strategic locations in chemical industry sites such as disposal, storage or stockpiling sites. It can also be mounted on autonomously controlled mobile objects such as a land rover or quad-copter. The data gathered can be viewed real time on the Telegram bot API dashboard interface as well as tabulated for further analysis and pattern recognition in a data server using SQL.

On comparing the weight analysis between the proposed model in this work to the one mentioned in [1], it was observed that, in the reference paper the final prototype having similar functionalities weighed 1.27 Kg whereas the proposed prototype in this project has a total weight of 0.87 Kg, thus improvement of 32% was observed in terms of weight .The prototype in [2] which used the Esp32 with no additional antenna was restricted to a range of 50-100m whereas in the proposed model the GSM module integration extends the range to a large extent and is restricted only by the lack of network coverage by service provider in a particular area. This increases the available time of the device and reduces downtime. In a hospital or strategic industry warehouse or site, the sleep mode incorporated onto the Esp32 can be configured to take periodic reading for every pre-set time interval according to the user requirement. This brings down the power consumption from 160-260 mA to 2-20 mA. Hence the overall performance was increased to 92% when compared with 4 such parameters.

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