

Abstract

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Electronic Noses for Monitoring Environmental Pollution and Building Regression Model

Electronic noses are intelligent designs that are able to classify and quantify different gases/ odors. This concept permits us to easily provide remote connectivity, large data storage and complex signal processing by using commercial sensors. In this paper a case study is presented for examining the use of sensor grid system concerning urban air pollution monitoring for carbon monoxide, carbon dioxide (CO, CO₂) gases for three different regions in Alexandria- Egypt along the Corniche and 2 different traffic roads. This is based on the integration of distributed sensors, data integration and developing a simple air pollutant model. The analysis and the characterization of environmental data are acquired by building a prototype of multi-sensors monitoring system (electronic nose), which are TGS 822, TGS 2442, TGS 813, TGS 4160, TGS 2600, temperature sensor, humidity sensor and wind speed measurements. All sensors are connected to the microcontroller (Pic 16F 628A) and PC to visualize and analyze data. Quadratic surface regression method is used to find possible correlations existence between some pollutants, elaborated by Matlab software and statistical analysis. The influence of meteorological quantities is taken into account to improve the model as well as different factors including weather conditions, topography and local situation. To investigate the performance of quadratic model, the interpolation quadratic function obtained is compared using the reduced data set after eliminating data in a random way with the results obtained using the original data set, then the mean square error (mse) is calculated. Analysis of variance (ANOVA) is used to detect the significant factors in the final quadratic equation and understanding the functional relationship between a set of independent factors.