Recent Research in Science and Technology 2014, 6(1): 39-40
ISSN: 2076-5061
Available Online: http://recent-science.com/

Use of artificial neuralnetwork for modeling of pollutent

Monica Singh[1] and Vaibhav Dewangan[2]

Shri Rawatpura Sarkar Institute of technology, New Raipur, India.

Abstract

Artificial Neural Networks (ANN) is implemented for predicting air quality. The models, in general, could predict air quality patterns with modest accuracy However, ANNM model performed extremely well in comparison to other models for predicting annual data as well as daily data. Industry emits small amounts of nitrogen oxides to the environment. As the regulatory authorities demand the reduction of the resulting air pollution, existing plants are looking for economical ways to comply with this demand. Several Artificial Neural Networks models were trained from several months of operating plant data to predict the NOx concentration in the tail gas, and their total amount emitted the environment. This paper describes the development of artificial neural network-based vehicular exhaust emission & industrial models for predicting carbon monoxide concentrations at air quality control regions in the city of Raipur, India, viz. a typical traffic intersection.Which can work with limited number of data sets and are robust enough to handle data with noise and errors.The Artificial Neural Networks models gave small errors, 0.6% relative error on the nitrogen oxides concentration prediction. Thenitrogen oxides emission rate, especially the beneficial effect of cooling the absorbed gas and reticulating liquids in the absorption towers.

Keywords: Artificial Neural Networks, industrial models, environment.

INTRODUCTION

Air pollution is becoming more important in the urban environment. air pollution has emerged as a major factor contributing to the quality of living in densely populated urban areas. Episodes of air pollution in urban centers are associated with sudden occurrence of high concentration of vehicular exhaust emissions which are generally governed by the local meteorology and dispersion mechanism. Air pollutants exert a wide range of impacts on biological, physical, and economic systems. Their effects on human health are of particular concern. The decrease in respiratory efficiency and impaired capability to transport oxygen through the blood caused by a high concentration of air pollutants may be hazardous to those having pre-existing respiratory and coronary artery disease. Consequently, it has become a vital task to accurately keep track of the variation of ambient air pollution levels in urban areas.Natural phenomena are mostly a time series with some degree of ran-domness. Pollutants in the atmosphere may disperse or concentrate during varied time periods. We have research many literature papers such as [1] (Giorgio and Piero, 1996) have indicated that the data of ambient air quality are stochastic time series, thereby making it possible to make a short-term forecast on the basis of historical data. [2] The most convincing advantage is that the accuracy of the neural network prediction is generally higher than that of the other kind of models (Viotti et al. 2002). [3] In addition, neural networks deal with the non-linearity, handles noisy or missing data, create their own relationship amongst information, work with large number of variables (parameters) and provide general solutions with good predictive accuracy (Gardner and Dorling 1998).

*Corresponding Author
Monica Singh
Shri Rawatpura Sarkar Institute of technology, New Raipur, India

Email: monica.singh21@gmail.com

ARTIFICIAL NEURAL NETWORKS

An Artificial Neural Network (ANN) is an information processing paradigm that is inspired by the way biological nervous systems, such as the brain, process information. The key element of this paradigm is the novel structure of the information processing system. It is composed of a large number of highly interconnected processing elements (neurones) working in unison to solve specific problems. ANNs, like people, learn by example. An ANN is configured for a specific application, such as pattern recognition or data classification, through a learning process. Learning in biological systems involves adjustments to the synaptic connections that exist between the neurones. This is true of ANNs as well.Neural networks, with their remarkable ability to derive meaning from complicated or imprecise data, can be used to extract patterns and detect trends that are too complex to be noticed by either humans or other computer techniques. A trained neural network can be thought of as an expert in the category of information it has been given to analyse.

AIR POLLUTION MANAGEMENT SYSTEM

To protect and inform local inhabitants several warning and alarming values are defined in Slovene air pollution regulation. Among them are hourly warning and alarming values andwarning 8 – hour moving average values.The aim of the presented research work is to construct a forecasting model, which would besuitable for the use at city municipal. The model basic capabilities should be forecasting ofthe nitrogen concentration values of the following day. Therefore the model would allowinforming of the citizens that a day with nitrogen alarm value is coming.For the start of the research we concentrate on the problem of maximal hourly value of ozoneconcentration that would appear in the following day. This value should be calculated on thebasis of all measurements available from the local automatic station.

MEASUREMENT OF THE POLLUTANTS CONSIDERED

The data consists of thirty-minute averages of the air pollutants examined.Average daily mass concentrations of NO, NO2, are used for the fiveyear. The data comes from the monitoring station in Szegeddowntown, located at a traffic junction. Gas analysers occur at two points. One of them is the 0-point, whichis set automatically in every 8 hours, while the other calibration point is set once in everyfortnight by a verified sample. Calibration of the NO_2 instrument is performed via gas phasetitration.computer serves to perform instrumental control and data storage. Dataare produced primarily as 1 min averages from 9s measurements. Then,20min averages are determined and stored

RESULTS

The concentrations of NO display annual cycle, while those of NO_2. Annual cycles for all three of them are characterised by winter maxima andsummer minima. In contrast, the concentrations of $NO_2$with a annual cyclehave a winter minimum and a summer maximum.

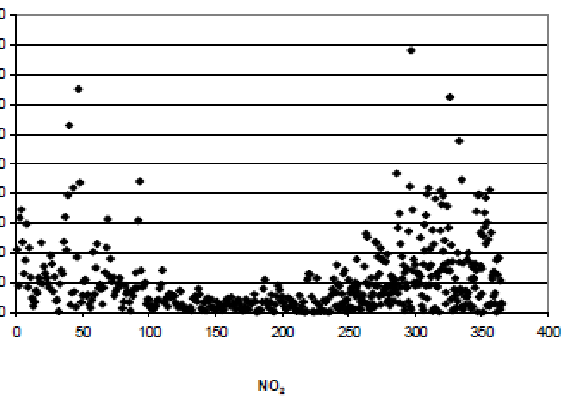

Fig.1

Fig. 2 depicts the average annual cycles of NO, NO_2, O3 and Ox, where Ox is ameasure of the O3 concentration, contained in an air mass. It is defined as the sum of $NO_2$and O3 and is more suitable for the assessment of the photochemical O3 budget than O3 alone. Because it takes the reversible chemical processes into account as well.

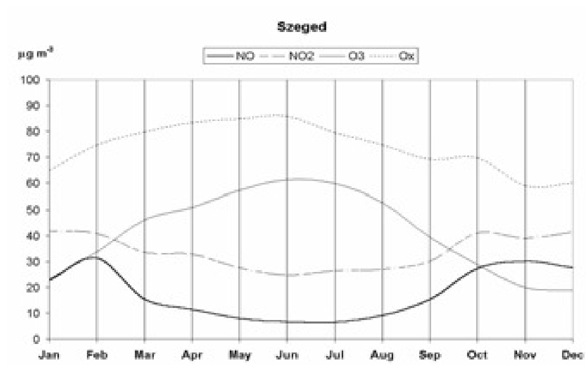

Fig. 2Average annual cycles of NO, NO2, O3 and Ox, monitoring station

CONCLUSIONS

1. The air pollutants examined show typical annual weekly and diurnal cycles.
2. The average annual cycles of NO, are opposite to those of O3 and Ox. The higher winter values are caused by atmospheric stability with frequent inversions.
3. The concentrations of $NO_2$and O3 are traffic related. Concentrations of NO_2 and TSP (O3) on weekdays are high (low), while on weekends they are low (high).

ACKNOWLEDGEMENT

The author thank Mr .vaibhav dewangan for his contribution with digital mapping. This study was supported by theShriRawatpuraSarkar Institute of Technology New Raipur.

REFERENCE

[1] ASCE Task Committee on Application of Artificial Neural Networks in Hydrol-ogy 2000a. Artificial neural networks in hydrology. I: preliminary con-cepts, J. Hydrologic Engineering, ASCE, 5(2), 115-123.

[2] ASCE Task Committee on Application of Artificial Neural Networks in Hydrol-ogy 2000b. Artificial neural networks in hydrology. II: preliminary con-cepts, J. Hydrologic Engineering, ASCE, 5(2), 124-137.

[3] Back, A.D., and Tsoi, A.C. 1991. FIR and IIR synapses, a new neural network architecture for time series modeling, Neural Computation, 3, 375-385.

[4] Basheer, A., and Najjar, M. 1996. Predicting dynamic response of adsorption columns with Neural Nets, J. Computing in Civil Engineering, ASCE, 10(1), 211-220.

[5] Boznar, M., Lesjak, M., and Mlakar, P 1993. A neural network-based method for short term prediction of ambient SO^2 concentrations in highly polluted in-dustrial areas of complex terrain, Atmos. Environ., 27B, 221-230.

[6] Chakraborty, K., Mehrotra, K., Mohan, C.K., and Ranka, S. 1992. Forecasting the behaviour of multivariate time series using neural networks, Neural Net-works, 2, 53-58

[7] Boger, Z., Guterman, H., Segal, T. 1996. Application of large-scale artificial neural networks for modeling the response of a naphtha stabilizer distillation train. *Proceedings of the AIChE annual meeting*, Chicago.

[8] Guterman, H. 1994. Application of Principal Component Analysis to the Design of Neural Networks. Neural, Parallel and Scientific Computing, 2, 43-54.

[9] Boger, Z. 2002. Artificial Neural Networks Modeling as a Diagnostic and Decision Making Tool. D. Ruan and P.F. Fantoni (eds.): Power Plant Surveillance and Diagnostics, Modern Approaches and Advanced Applications, Physica-Verlag, Chapter 16, 243-252.