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Abstract

PREDICTION OF AMBIENT AIR POLLUTANT  
CONCENTRATIONS IN MACAO WITH ARTIFICIAL  
NEURAL NETWORK

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The air quality of Macao is deteriorating in the recent years due to the rapid economic and population growth of itself and of its surrounding areas. In Macao, where the tourism being the leading industry of the city, a relatively good prediction of ambient air pollutant concentrations frequently updated for the public is significant.

The intention of this study is to design some economic and flexible artificial neural network models using MATLAB<sup>®</sup> V7 software and MATLAB<sup>®</sup> Neural Network Toolbox V4.0 for the 12-hour-ahead and 24-hour-ahead predictions of concentrations of the five “criteria” ambient air pollutants, which constitute the air quality index system of Macao.

One relatively comprehensive set of hourly data of both ambient air pollutants and meteorological items measured from 1/May/1999 to 30/April/2000 is acquired from the Meteorological & Geophysical Services of Macao (SMG). Data is divided into two time frames, namely ‘summer’ and ‘winter’.

For both ‘summer’ and ‘winter’, totally twenty ‘three-layer feedforward networks’ (TLFN) are designed for both 12-hour-ahead and 24-hour-ahead hourly predictions of the five criteria pollutants correspondingly.

Prediction values are compared with actual measurement values. Absolute relative percentage error (ARPE) and mean absolute percentage error (MAPE) are the comparison criteria. The best performances are the 12-hour-ahead and 24-hour-ahead predictions of carbon monoxide in ‘summer’, where 100% of the total predictions have the ARPE values smaller than 30%. The worst performance is the 12-hour-ahead prediction of nitrogen dioxide in ‘summer’, where 83% of the total predictions have the ARPE values larger than 50%.