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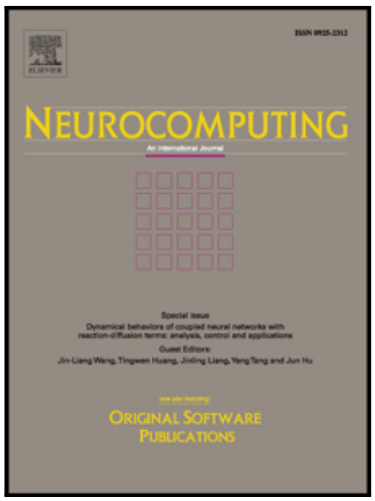

On the Problem of Forecasting Air Pollutant Concentration with Morphological Models

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On the Problem of Forecasting Air Pollutant Concentration with Morphological Models

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Abstract

In this paper we present a study about the time series generator phenomenon from air pollutant concentration forecasting problems. It provides several evidences suggesting that this kind of generator phenomenon has nonlinear characteristics with long-term dependencies. Based on that, we present a nonlinear morphological model able to forecast these time series. Also, a descending gradient-based method, using ideas from the back-propagation algorithm, is presented to design the proposed model. Furthermore, an empirical analysis is conducted with the proposed model using a set of six relevant air pollutant concentration forecasting problems and employing three statistical measures to assess forecasting performance.

Key words: Air Pollutant Concentration, Time Series, Forecasting, Empirical Analysis, Morphological Modeling.

1 Introduction

Currently, the air pollution issue has aroused a growing interest of the society due to its impacts on the well-being of the population. It is caused by several agents that make the air harmful and unsafe to human health (Voukantsis et al., 2011; Vlachogianni et al., 2011; Kiesewetter et al., 2015). The quality of the air depends on several factors, which can contribute or not to the dispersion of pollutants. Among them, it is worth mentioning the weather, topography and the magnitude of pollutant concentrations in the region (Fernando et al., 2012).

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