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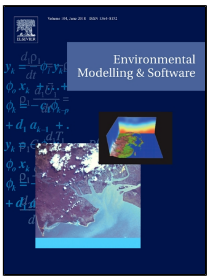

Long-Term Forecasting of Nitrogen Dioxide Ambient Levels in Metropolitan Areas Using the Discrete-Time Markov Model

Asaf Nebenzal, Barak Fishbain

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Long-Term Forecasting of Nitrogen Dioxide Ambient Levels in Metropolitan Areas Using the Discrete-Time Markov Model

Asaf Nebenzal[a] and Barak Fishbain[b*]

[a] Department of Mathematics, Technion – Israel Institute of Technology, Haifa 320003, Israel, asaf.n@technion.ac.il

[b] Faculty of Civil and Environmental Engineering, Technion – Israel Institute of Technology, Haifa 320003, Israel, fishbain@technion.ac.il

[*] Corresponding author: B.F, Faculty of Civil and Environmental Engineering, Technion – Israel Institute of Technology, Haifa 320003, Israel, fishbain@technion.ac.il; Tel: +972-4-8293177; Fax: +972-4-8228898

Abstract

Air pollution management and control are key factors in maintaining sustainable societies. Air quality forecasting may significantly advance these tasks. While short-term forecasting, a few days into the future, is a well-established research domain, there is no method for long-term forecasting (e.g., the pollution level distribution in the upcoming months or years). This paper introduces and defines *long-term* air pollution forecasting, where *long-term* refers to estimating pollution levels in the next few months or years. A Discrete-Time-Markov-based model for forecasting ambient nitrogen oxides patterns is presented. The model accurately forecasts overall pollution level distributions, and the expectancy for tomorrow's pollution level given today's level, based on longitudinal historical data. It thus characterizes the temporal behavior of pollution. The model was applied to five distinctive regions in Israel and Australia and was compared against several forecasting methods and was shown to provide better results with a relatively lower total error rate.

Keywords: Air pollution Modeling; Discrete-Time Markov model; Long-term forecasting; Modeling; Risk assessment; Nitrogen dioxide (NO_2)

Software availability: Name of software: Long-Term Air-Pollution Forecasting; Developer: A. Nebenzal, Dept. of Applied Math, Technion – Israel Institute of Technology, Email: asaf.n@technion.ac.il; Year first available: 2018; Software required: Matlab 2015 (and up);

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