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Seminarium Zakładu Energetyki Jądrowej i Analiz Środowiska (UZ3) Departament Badań Układów Złożonych (DUZ)

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Can the Artificial Neural Network Be Applied to Estimate the Atmospheric Contaminant Transport?

Abstract:

Providing a real-time working system able to localize the dangerous contaminant source is one of the main challenges of the cities emergency response groups. Unfortunately, all proposed up to now frameworks capable of estimating the contamination source localization based on recorded by the sensors network the substance concentrations are not able to work in real-time. The reason is the significant computational time required by the applied dispersion models. In such reconstruction systems, the parameters of the given dispersion model are sampled to fit the model output to the registrations; thus, the dispersion model is run tens of thousands of times.

In this research, we test the possibility of training an artificial neural network (ANN) to simulate the atmospheric toxin transport in the highly urbanized area effectively. The use of a fast neural network in place of computationally costly dispersion models in systems localizing the source of contamination can enable its fast response time. As a training domain, we have chosen the center of London, as it was used in the DAPPLE field experiment. The training dataset is generated by the Quick Urban & Industrial Complex (QUIC) Dispersion Modeling System. To achieve the ANN capable of estimating the contaminant concentration, we tested various ANN structures, i.e., numbers of ANN layers, neurons, and activation functions. The performed tests confirm that trained ANN has the potential to replace the dispersion model in the contaminant source localization systems.

Serdecznie zapraszamy
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