Paper Title: An integrated simulation system for traffic induced air pollution

Paper link:
https://www.academia.edu/58950928/An_integrated_simulation_system_for_traffic_induced_air_pollution?from_sitemaps=true&version=2

Summary

1.1 Motivation/purpose/aims/hypothesis

The main objective of this paper is to create a simulation system that can analyze the movement of traffic, the emissions it produces and the subsequent air pollution, in areas. Traffic control plans are required in place such as rerouting or encouraging the use of public transportation, in order to effectively manage travel times and reduce air pollution. That's why a simulation system has been developed that integrates all these components together.

1.2 Contribution

In this paper, the key contributions are the combination of these three different models. The usage of one model's output as an input for the next model and ultimately linking air pollution and traffic in the most effective way. The three models are: traffic model, emission model and pollution dispersion model. This detailed simulation could only be made possible due to the usage of a large amount of statistics as done in this study.

1.3 Methodology

The methodology integrates the models DYNEMO for traffic flow, a statistical model for emissions based on vehicle type and activity, and DYMOS for pollution dispersion which uses two most frequent occurring types of smog: winter and summer. These are submodels that are then used in the following order: traffic flow model to traffic emission model to the air pollution simulation system. The models are parallelized and implemented in a distributed computing environment.

1.4 Conclusion

The integrated modeling system enables improved simulation of traffic emissions and resulting air pollution compared to previous approaches where the simulations were done separately.

Limitations

2.1 First Limitation/Critique

The emission model relies on simplified statistical representations of vehicle activities, such as, driving patterns or cycles rather than being directly coupled to the dynamic vehicle activities

simulated in DYNEMO. As this approach is less realistic, it reduces the accuracy of the emission modeling.

2.2 Second Limitation/Critique

Validation of the integrated model results is limited as only one simulation run has been compared to the real-world data, reducing confidence in the accuracy of the simulations. More rigorous validation against real-world measurements is needed.

Synthesis

This proposed model enables the analysis of different strategies as mentioned before for the control of traffic related air pollution. The measure of usefulness of these different strategies can be computed by the simulation to take necessary steps for better health and environment. Multiple simulations can be carried out using the SIMTRAP model. These simulations can then be used to compare different strategies aiming at shorter travel times and reduction in traffic related air pollution.