



National Science Foundation
WHERE DISCOVERIES BEGIN

*Overview of RET
Project #5*

Simulation Analysis of Traffic-Operation-Related Emission

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Background

- Recent studies indicated that exposures to traffic emission increase the risk of adverse health effects for people, in particular for young developing children going to school near large roadways.
- Traffic-generated air pollutants: carbon monoxide (CO) and particulate matters (PM_{2.5}), etc.
- It is still not very clear that how different traffic operation conditions will affect the traffic related emission.



Goal and Objectives

- Goal: to explore the methodology for analyzing the impact of traffic flow operation on the on-road emissions by using simulation approach.
- Objectives:
 - Setting up microscopic traffic models under the simulation software environment.
 - Calibrating and validating the simulation models using field collected traffic data.
 - Inputting the simulation results into an emission factor simulator to estimate the on-road emissions.
 - Verifying the estimated on-road emissions using field collected emission data.



Traffic Simulation

- What is traffic simulation?

Traffic simulation is to use numerical techniques on a computer to create a description of how traffic behaves over extended periods of time for a given transportation facility or system. Simulation models predict performance by stepping through time and across space, tracking events as the system state unfolds. (HCM 2000).

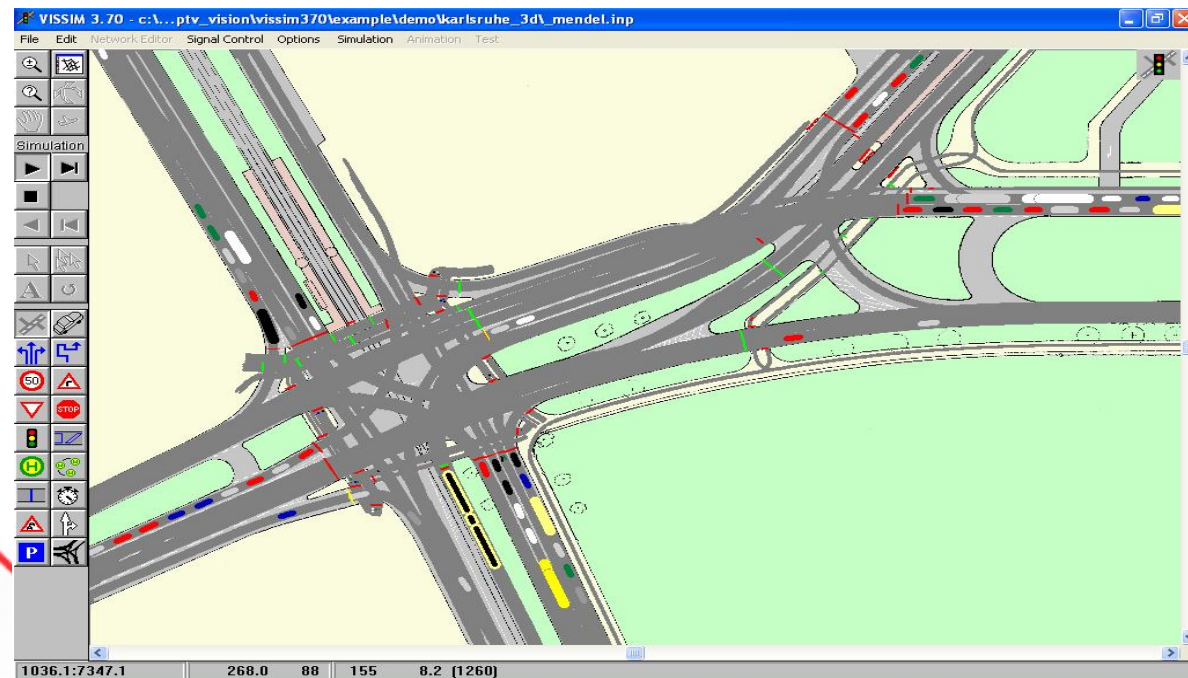
- Why use traffic simulation?

Large amount of field collected data is not required, and only minor field data will be needed to calibrate and validate the traffic simulation models



Traffic Simulation

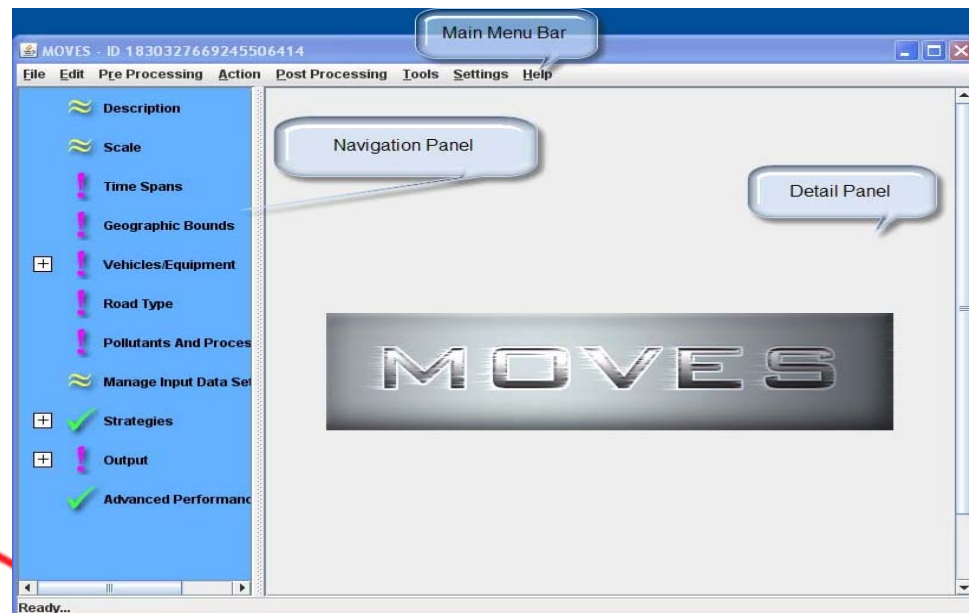
- VISSIM is a microscopic, time step and behavior based traffic simulation software that models multi-modal traffic flow and realistically simulate urban and highway traffic flow, pedestrians and cyclist.





Emission Factor Simulator, MOVES

- MOVES is a emissions modeling tool, which can be used to estimate national, state, and county level inventories of criteria air pollutants, greenhouse gas emissions, and some mobile sourced air toxics from highway vehicles.
- For any given traffic scenario, VISSIM can be running to simulate the traffic operation and result in vehicle trip distribution aligned with other parameters that are required as inputs to MOVES, and the MOVES is used to estimate on-road emissions.





Study Site

- Proposed study site: A section of I-75 near the location of 1030 Cutter St, Cincinnati, OH 45203





Data Collection

- Vehicle trajectory data gained by Global Positioning System (GPS) Travel Loggers to calibrate the travel behavior parameters involved in VISSIM.
- GPS data: Travel time, traffic speed





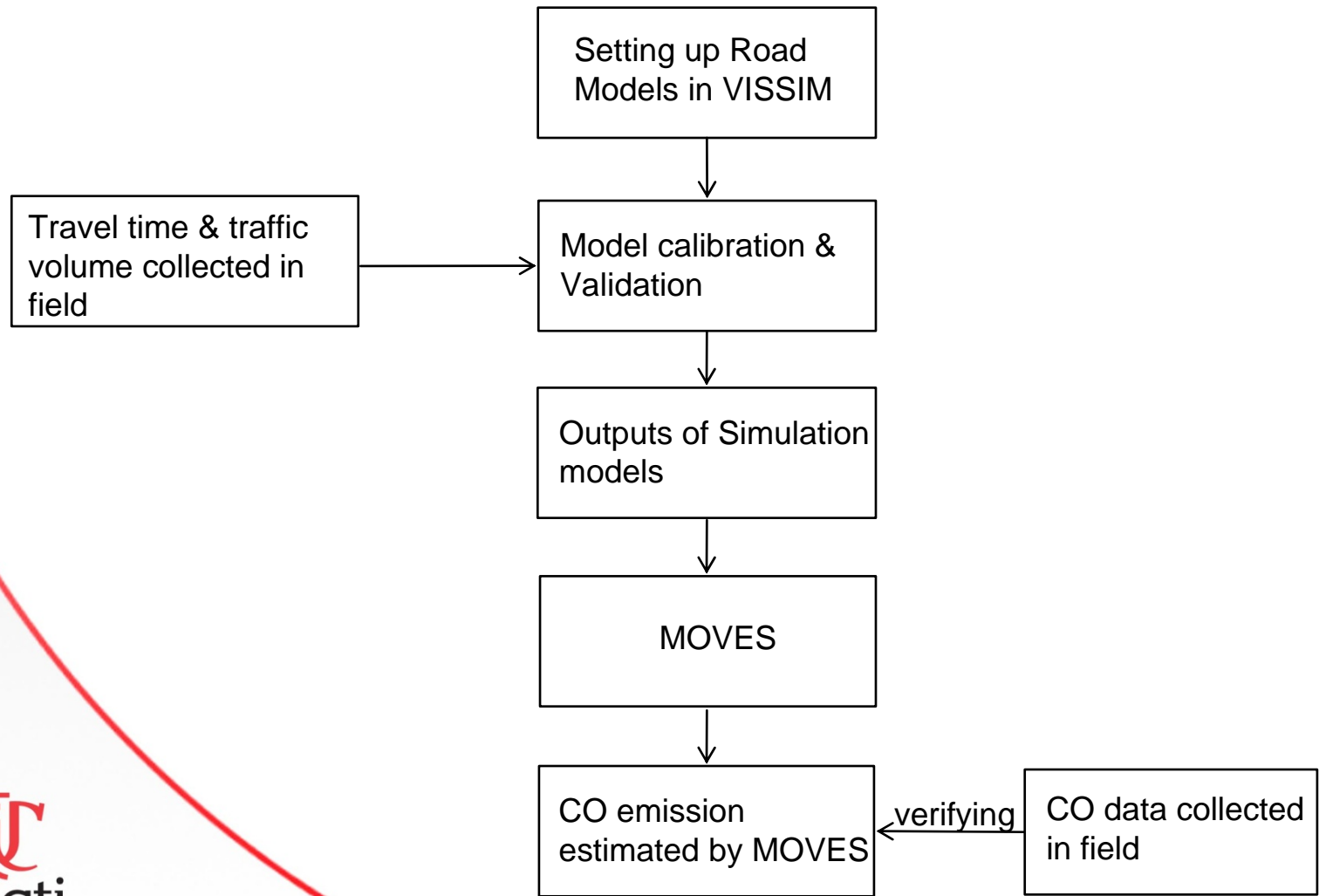
Data Collection

- A camcorder and CO sensor will be placed on an overpass across the selected highway segment to collect traffic video data and traffic-related CO emission, respectively.





Modeling and Analysis





Weekly Schedule

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|----------------------|--|
| 1 st Week | Training and practice of basic traffic and emission theories and field data collection |
| 2 nd Week | Training and application of simulation software and data analysis |
| 3 rd Week | Training and application of simulation software and data analysis |
| 4 th Week | Training and application of simulation software and data analysis |
| 5 th Week | Conduct “what-if” analysis and set up hands-on examples for classroom implementation |
| 6 th Week | Prepare final presentation, final report, and summary |



Questions?

