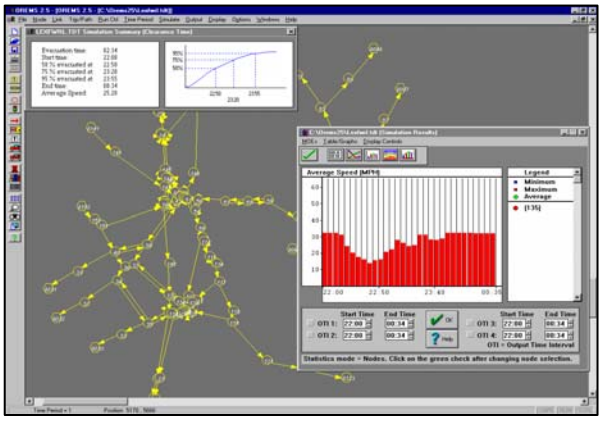
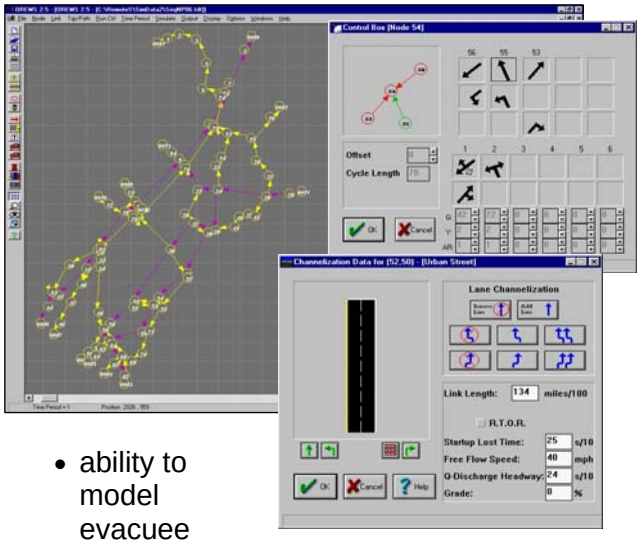
Center for Transportation Analysis

Oak Ridge Evacuation Modeling System (OREMS)

The vulnerability of communities to terrorist inflicted damage at facilities such as dams, power plants, or oil/gas distribution facilities, and others, is partly determined by the ability to avoid impacts. OREMS, or the Oak Ridge Evacuation Modeling System, is a Windows-based software program designed to analyze and evaluate large-scale vehicular emergency evacuations, conduct evacuation time estimation studies, and develop evacuation plans. The goal was to produce a software system that utilizes the latest traffic simulation software from the Department of Transportation that would run faster than other models and simplify the data input and modeling processes.





Some uses of OREMS in Emergency Management include:

- modeling of large transportation networks (covering emergency planning zones that cover thousands of square miles),
- determining the feasibility of evacuation without detailed route planning,
- identifying best evacuation routes,
- identifying bottlenecks that would constrain the flow of traffic,
- assessing the effectiveness of alternative traffic control strategies,
- assessing the effectiveness of different evacuation strategies,
- estimating traffic speed and other measures of effectiveness on specific roads or potions of the network, and
- estimating clearance times for the network or potions of the network.

Some of the advantages of OREMS include:

- easy data entry through a user-friendly interface,
- extensive context-sensitive help,
- ability to create evacuation zones
- through a rubber-banding tool,
- ability to zoom in and out of the network,
- ability to model evacuee response rates,
- ability to easily modify the network to simulate accidents or other impediments,
- ability to modify the network to assess traffic control strategies such as lane reversal, and
- ability to graphically display the results of the simulation statically and dynamically.

Research Areas

Freight Flows

Passenger Flows

Supply Chain Efficiency

Transportation: Energy Environment

Safety Security

Vehicle Technologies

Oak Ridge National Laboratory
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Evacuation Plan Development and Maintenance

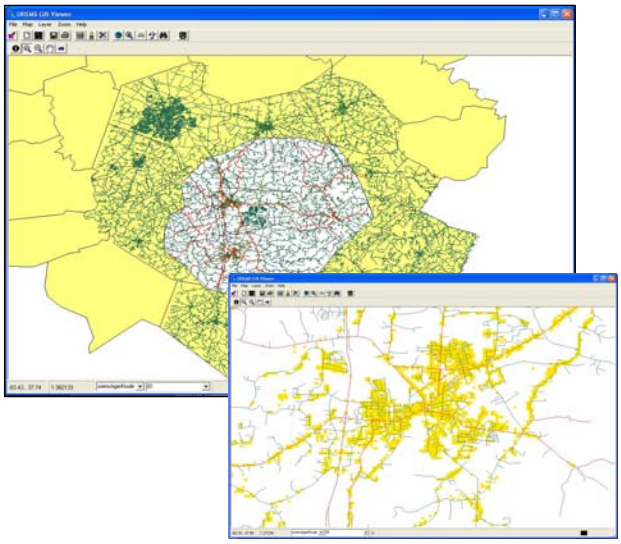
Emergency evacuation plans require that the relevant information that is input to the models (i.e., network topological and capacity information, and spatial demographic data) be kept up-to-date. Research is being conducted at ORNL to develop methods and procedures to integrate information obtained from remote sensing sources into OREMS. Once implemented, road network attributes, specifically capacity reductions due to construction and road maintenance, will be extracted from remotely sensed data, and then compared with existing GIS databases to identify network changes so as to allow quick update of the OREMS data and plans.

Consequence Management

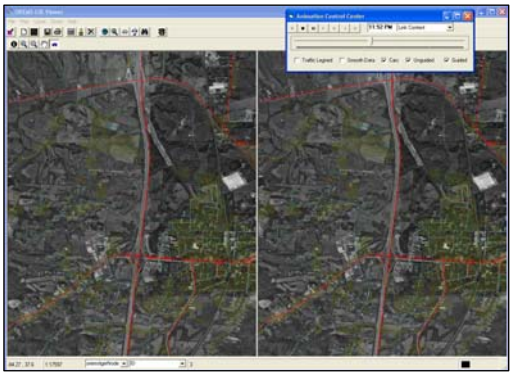
After the events of 9/11, it became apparent that it is impossible to harden the infrastructure to avoid losses in a range of damage scenarios. If damage occurs, the goal is to minimize those loses by an effective response and to achieve a rapid recovery. ORNL is currently developing a prototype system to demonstrate the feasibility of intelligent consequence management (ICM). Such a system will utilize state-of-the-art sensor technology and wireless communications coupled to faster-than-real-time simulation and decision-support models. Such a system would greatly enhance management of crises in rapidly unfolding events.

A critical component of the ICM system is the analysis of the feasibility of large-scale emergency evacuations anywhere in the nation, for different sizes of affected areas, and as fast as possible. To achieve these goals, ORNL is developing a traffic simulation tool, with OREMS at its core, which can be deployed anywhere and with very short notice.

The system consists of a GIS interface which can generate the transportation network topology and parameters that are inputs to OREMS, either using available GIS databases of the area at risk (if they exist), or its own USA database and probabilistic traffic parameter generation model. To create the demographic model of the population at risk for both nighttime and daytime evacuations, the tool utilizes the ORNL-developed LandScan USA high-resolution population database.



If the evacuation alternative is deemed feasible, the next challenge is to provide information (i.e., real-time traffic conditions) during the evacuation to the simulation models and to the decision makers. This is a difficult problem, especially when considering the ICM requirement of universal deployment. ORNL is proposing the evaluation of new technologies that can quickly be deployed to determine how well they perform in providing the real-time traffic information needed during an emergency evacuation.



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