

### Project 15: Emergency Response Modeling (Larson)

This project builds on existing operations research models to develop a freely available, downloadable planning tool for municipal administrators to plan for response to large events in their communities.

**Modeling Area:** Risk Management

**Principal Investigator:** Richard C. Larson

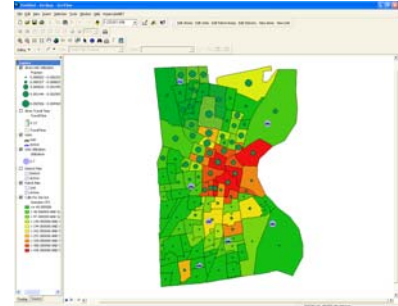
**Institution:** Structured Decisions Corporation

**Other Investigators:** James M. Tien

**Student Research Assistants:** Michael Metzger

#### Brief Description:

SDC is developing a family of analytical planning models that incorporate personnel and equipment resource allocation during the response to a major unexpected event. The research focuses on decision models for emergency response, especially response to terrorist attacks and major acts of nature. The model being developed is appropriate for police and emergency medical first responders to deploy their resources over space and time. Building from our recently demonstrated PC-based Hypercube Queuing Model, we are now including the effects of a major emergency event in the urban area.



Hypercube Queuing Model Display

#### Objectives:

The key objective of this effort is the design, development, testing and dissemination of catastrophic event emergency response planning models.

#### Major Products and Customers:

The main product is a computer-based planning model. Others are publications and presentations at conferences and other events. The primary customers are municipal decision makers whose responsibility it is to create Preparedness and Response Plans to major events. The other 'customers' are applied researchers and students who are doing or who plan to do research in homeland security.

#### Interfaces to other CREATE Projects:

This project interfaces with the Risk Management project being conducted by USC's Maged Dessouky and Fernando Ordenez.

#### Interfaces to non-CREATE Projects:

We will explore a relationship with MIT on building a decision support tool for Hurricane Preparedness and Response.

#### Technical Approach:

We use techniques of applied operations research, computer science, and relevant aspects of social science such as participant observation and focus groups. The major tasks planned include

1. Characterizing over space and time the 'region affected' by a major emergency event such as terrorist attack or act of nature, and translate this characterization into the Hypercube Model framework.
2. Creating and implementing algorithms for the first responders to dispatch a fraction of their resources into the 'affected region' and to re-position their remaining resources over the rest of the service region.
3. Utilizing the work of the New York City Rand Institute, move the mathematics and algorithms of award-winning Fire Deployment Relocation Model (FDRM) into the GUI and general modeling framework of this project, so that the final model is useful to fire department planners as well.
4. Demonstrating the model to planners practicing in first responders agencies, obtain their constructive feedback.
5. Finalizing the model and posting it on the Internet for free downloading.

#### Major Milestones and Dates:

1. Region Geometry -- July, 2005
2. Algorithms -- September, 2005
3. Fire Department Relocation Model -- February, 2006
4. Demonstration -- March, 2006
5. Design Document -- March, 2006