

#### Mid-America Earthquake Center





# **MAEViz**

#### Mid-America Earthquake Center Seismic Loss Assessment System

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University of Illinois at Urbana - Champaign (MAE Center Headquarters)

Georgia Institute of Technology Texas A&M University University of Memphis University of Michigan University of Puerto Rico, Mayaguez Campus University of Texas, Austin Washington University



http://maeviz.ncsa.uiuc.edu







# What is MAEviz?

- MAEviz is an extensible network aware application and environment
- MAEviz integrates spatial information, data, and visual information to perform risk assessment and analysis.









### Digital Observatories







### The MAEviz Model

• MAEviz Implements Consequence-Based Risk Management (CRM)





# Mid-America Earthquake Center MAEviz – Quick View





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# Decision Support - Data Aggregation

- Building Dataset
  - Memphis Building Inventory (w/out single family homes)
- Event
  - Magnitude 7.9 Earthquake at Blytheville, AR
- Analysis
  - Equivalent Cost Analysis
    - Death = \$5,000,000 per
    - Injury = \$1,500,000 per
    - Function loss = \$100,000 per sq. ft. per day



Deaths (\$) by Census Tract



#### Monetary Loss by Census Tract



Injuries (\$) by Census Tract





# Sensor Deployment





### Measured Time-history Data



# Modal Information



### **Bio-Inspired Smart Sensor Networks** for Adaptive Emergency Response

### **OBJECTIVES**

- Advanced bio-inspired sensing and communications framework for earthquake disaster response:
  - capable of self-organization and adaptation for sensing, filtering, and transmission of missioncritical data
  - using networkable smart devices for distributed, real-time support of both emergency responders and victims

### **TECHNOLOGICAL CHALLENGES**

- Apply biological principles of (i) collective behavior and division of labor observed in social insects, and (ii) neurobiological information processing strategies such as sparse coding and layered response architectures, to cope with problems that frequently exist in the chaotic and inhospitable environment of disaster relief operations, such as reliability, consistency, trustworthiness, information overload, using self-organization, and efficient collaboration protocols.
- Develop heuristics and algorithms to:
  - determine the stability of the physical infrastructure
  - self-organize and coordinate available sensor resources
  - determine the condition of victims and infrastructure
  - determine the spatial location of victims and hazards



### **BROADER IMPACTS**

- New paradigm for coordination and management of emergency responders to locate and rescue earthquake disaster victims
- Assess the status of built infrastructure
- Multidisciplinary environment for student education and training
- Directly applicable to other natural and man-made disasters
- Broad opportunities for international collaboration
- Significant improvement in first responders ability to handle disasters and save the lives of individuals.

