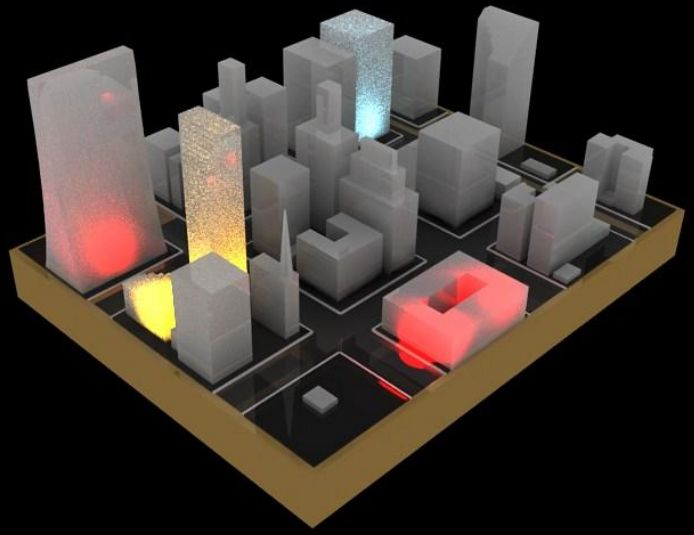
Design and Build Chicago Scale Model for Dynamic Disaster Simulation



iPro 317
Dr. Megri

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  - Electrical
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- Scenarios
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Team Members

- Architecture (8 students)
  Grahm Balkany, Michael Brassil, Dung Luu, LaLuce Mitchell, Daniel O'Brien, Homero Rios, Daniel Socher, Marco Trusewych
- Chemical Engineering (1 student)
  Hana Fakhouri
- Electrical Engineering (2 students)
  Mary Cyriac, David Parry
- Architectural Engineering (2 students)
  Jodi Balido, Brandon Macklin
- Computer Science (1 student)
  Donald Myers
- Aerospace Engineering (1 student)
  Sonya Martin

Subgroups

- Architecture (8 students)
  - Determine building selection and representation
  - Determine standards for physical construction
  - Design and build 3D model
- Animations (2 students)
  - Determine software for displaying scenarios
  - Code scenarios
- Scenarios (3 students)
  - Meet with CFD to develop realistic disaster scenarios
- Electrical Engineering (2 students)
  - Determine effective method for dynamic lighting of model

Objective

- Plan, build and construct 3D model of downtown Chicago
  - Chose appropriate section of downtown Chicago for modeling
  - Develop scale for optimal viewing of model
  - Determine appropriate materials for construction
  - Create CAD drawings of buildings
  - Cut and construct scale section of Chicago
  - Simulation of disaster strategies through Flash animations

Use

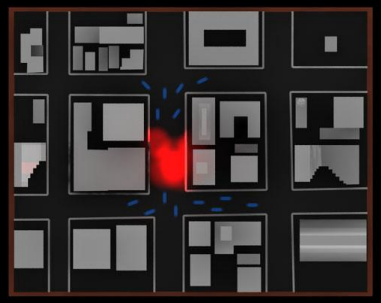
- Disaster response simulation and testing
  - Chicago Fire Department demonstration of possible city wide disaster scenarios

- Disaster response training
  - Tool for training of city organizations (Fire, Police, Medical, Bomb Squad etc.) how to respond to city wide disaster

Benefits

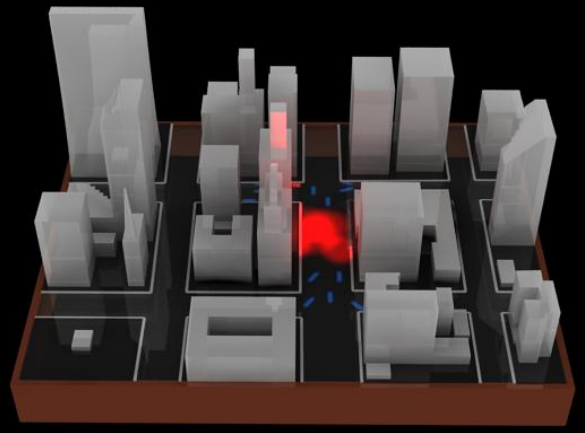
✧Real time disaster scenario simulation

- Small scale simulation of real life events
- Infinite repeatability
- Ease of use and implementation
- Infinite scenario possibilities
- Dynamic disaster simulations for city's reference



✧Three dimensional semi-mobile model

- Ease location recognition
- Little technical knowledge necessary
- Ability to reach vast audience

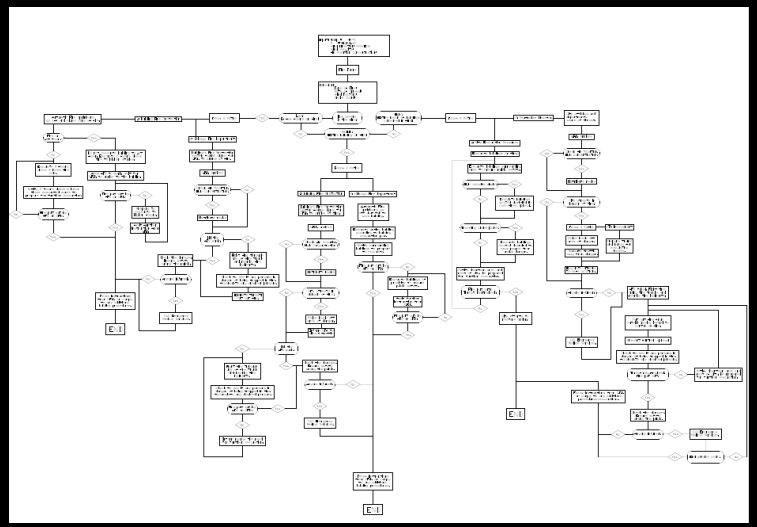


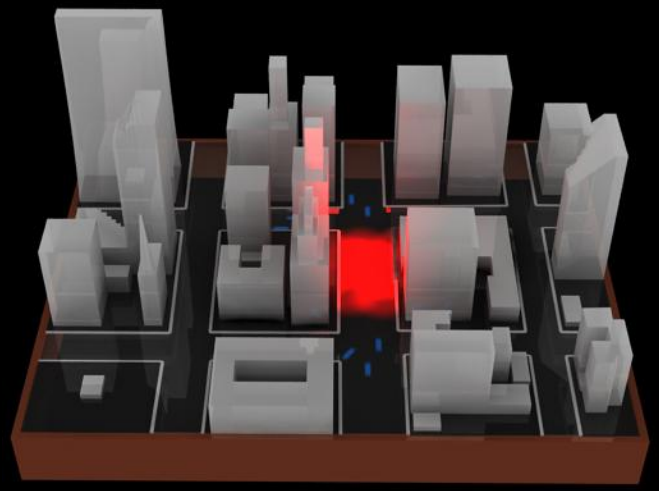
Method: Scenario Development

- Meeting with Chicago Fire Department
- Research obtained from city emergency data
- Looking at emergency routes
- Understanding city emergency operations

Scenarios

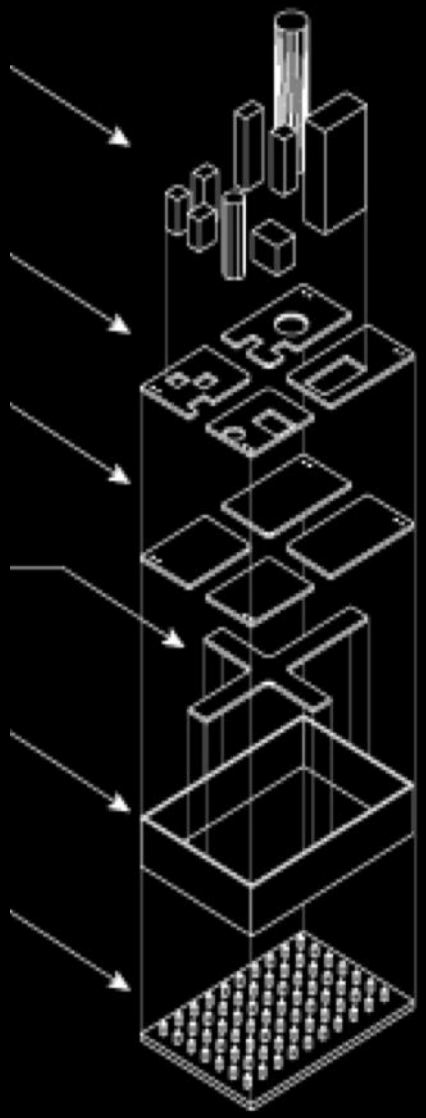
- Possible scenarios considered when coding
  - Small, Medium and Large scale fire
  - Single and multiple bomb explosions
  - Specific area evacuation



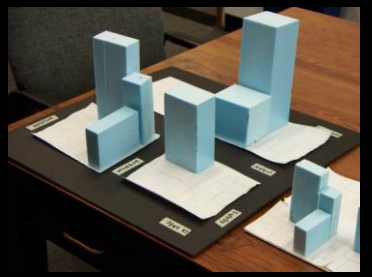


Model Overview

- Base:
  - Custom design and handmade
- Support:
  - Acrylic Cross brace throughout model
- Street, Housing and Buildings:
  - Milled Acrylic
- Internal Lighting:
  - Sanyo PLC-XL50 ultra short throw projector
- Software:
  - Adobe Flash



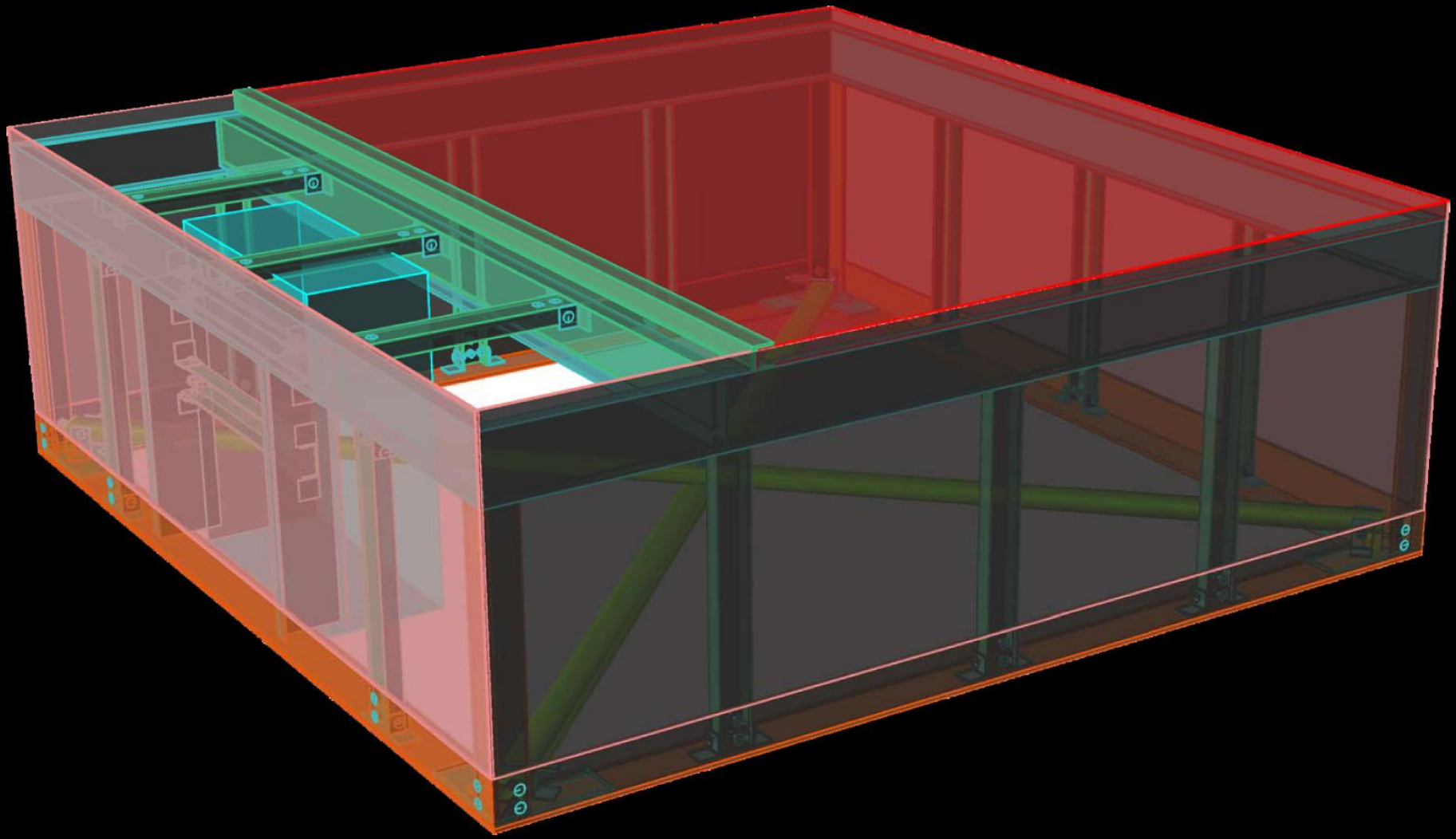
Considered Methods



- Construction:
  - Acrylic models built to scale
  - Sanding and milling of building models
  - Computer aided and mechanized cut-outs
- Lighting:
  - TFT (Thin film transistor) Film
  - LCD screen
  - Commercial grade LED matrix
  - Homemade LED matrix and controller
  - Under light projected display

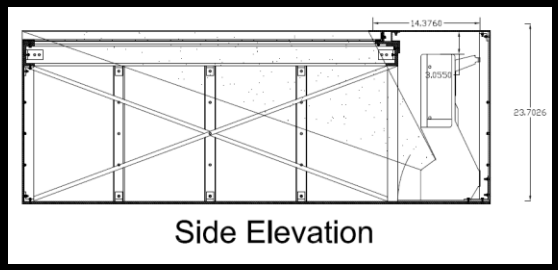
Method: Construction

- Building location and dimension information obtained using:
  - Google maps (Satellite, 3-D Buildings and Street views)
  - Microsoft Live maps
  - GSIS
  - Cook County Assessor Interactive
- Softcopy representation designed using:
  - Auto CAD
  - Rhino
- Hardcopy representation constructed from Acrylic, wood, aluminum… using:
  - Laser cutter
  - Wood saw
  - Band saw
  - Fly Cutter
  - Mill

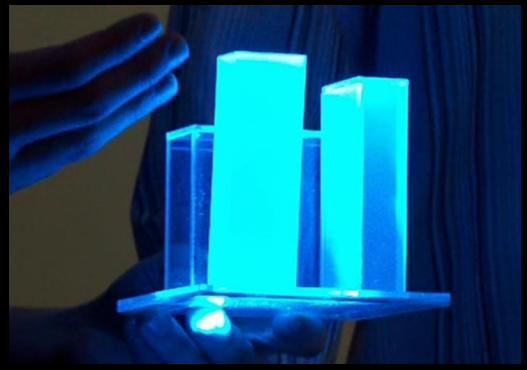


Method: Implementation

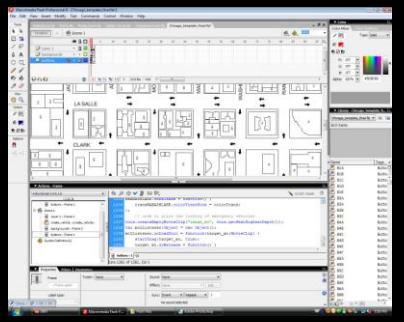
- Dynamic visual representation of scenarios accomplished using:
  - Adobe Flash
  - Sanyo PLC-XL50 Projector
  - Custom model stand
  - Laptop running Flash animation



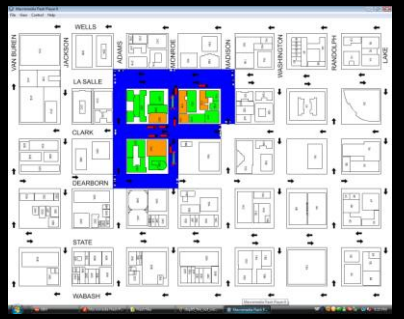
Side Elevation



Method: Coding and Lighting



- Using Adobe Flash:
  - Scenarios were coded to take place on virtual representation of actual 3D model



- Using Sanyo projector:
  - Coded scenarios displayed from beneath 3D model to incorporate simulation and 3D models

Future Considerations

- Expanding the scope of the city scale model
- Defining multiple disaster scenarios
- Developing animations for several cases
- Allow user input and data input for software
- Fully functional and interactive model

Thank You

Any Questions?