



# Meguro LAB.

http://risk-mg.iis.u-tokyo.ac.jp/

## [Comprehensive Disaster Management by both Structural and Non-structural Countermeasures]

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### Department of Human and Social Systems Urban Earthquake Disaster Mitigation Engineering

## Implementation of earthquake safer built environment

- Japan has entered a period of high seismic activity. Within next 30 to 50 years, magnitude 8 (M8) class earthquakes may happen 4, 5 times and M7 class earthquakes may strike Japan 40 to 50 times. Typical one with M 7 is Tokyo Metropolitan inland earthquake and those with M 8 are Tokai, To-Nankai and Nankai earthquakes along Nankai-Trough. The Central Disaster Prevention Council, Japan, estimated their damage in 2003 and 2005 and total damage reported was 200 trillion yen, including 2million collapsed/burnt buildings and houses. Based on the 2011 Great East-Japan Earthquake disaster, the Council re-estimated the damage and reported over 220 trillion yen damage by M 9 gigantic earthquake along Nankai-Trough and 95 trillion yen damage by Tokyo Metropolitan inland earthquake. Total structural damage estimated was over 3 millions and over 300 thousand fatalities.
- Can you protect your important persons and things, and yourself from these earthquakes? The most important point for disaster reduction is "How to increase the number of people who can really imagine the situation around them as time goes since the hazard attack". This capacity is called "Disaster Imagination Capacity" and an appropriate countermeasures requires it. Our research group has established Risk Management and Integrated Disaster Information System to increase Disaster Imagination Capacity and has been studying structural and non-structural countermeasures to minimize the negative impact due to future earthquakes.



### Hardware (Physical Analysis)

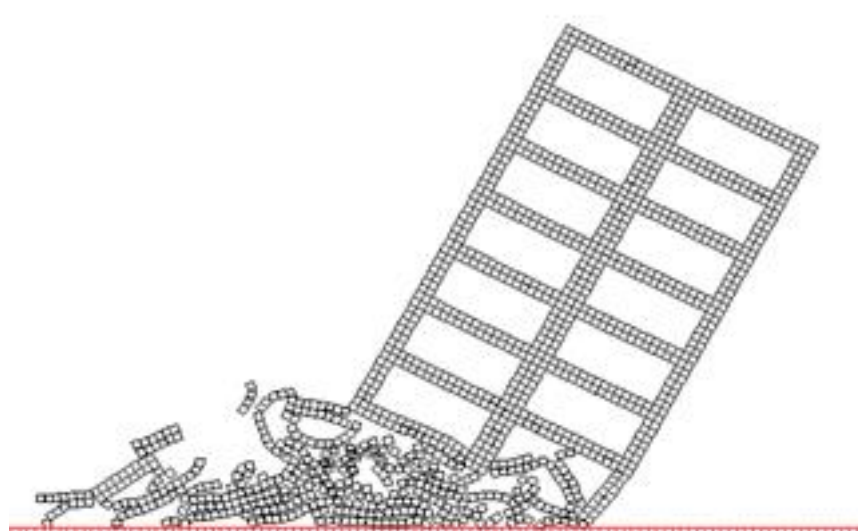
#### ■ Retrofitting of weak masonry structures

Proposal of highly effective method which is easy and cheap for retrofitting weak masonry structures in the area where there are many earthquakes



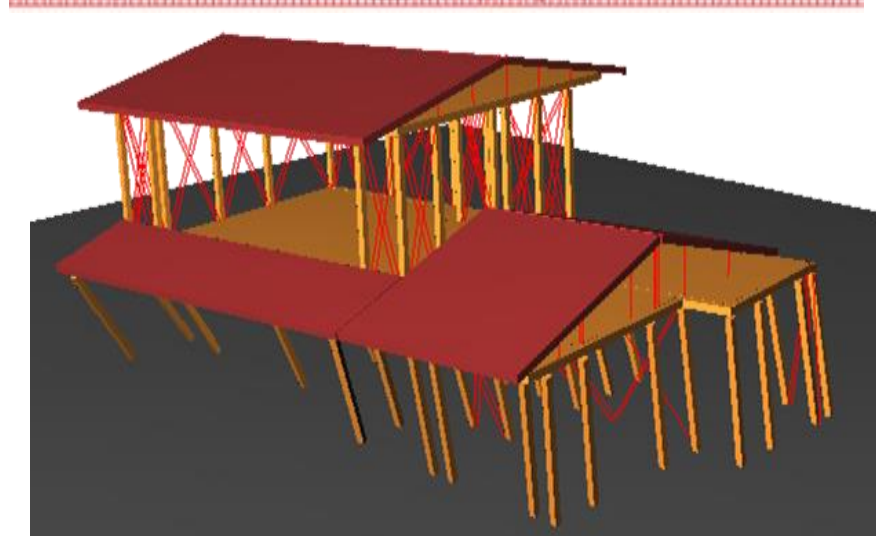
#### ■ Building Collapse Analysis

Building collapse simulation using Applied Element Method (AEM) which enables high-accurate analysis from continuum to non-continuum.



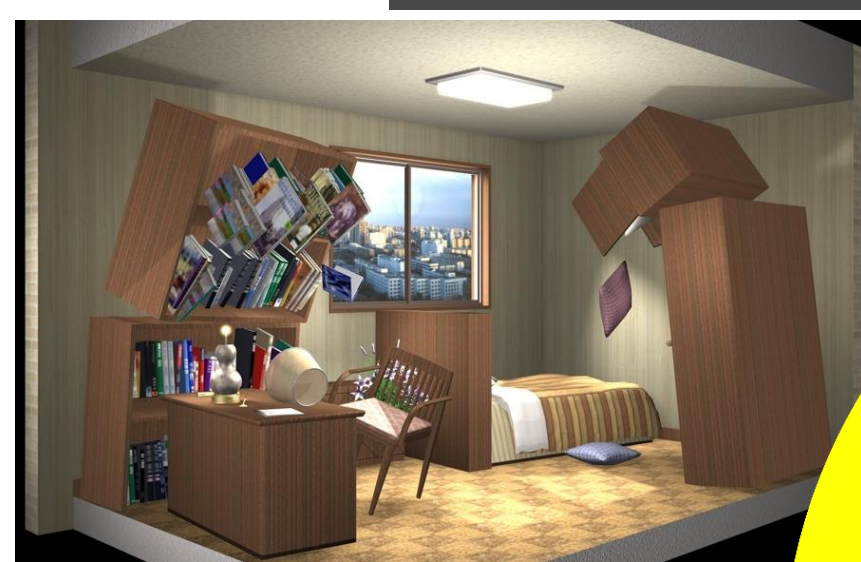
#### ■ Housing Collapse Diagnosis

Development of seismic diagnosis method using vibration generator and Discrete Element Method (DEM). Figure shows the housing collapse simulation by DEM.



#### ■ Furniture Overturning Analysis

Furniture overturning simulation using Extended DEM. Difference in the layout of the room and furniture were analyzed.



### Software (Social Analysis)

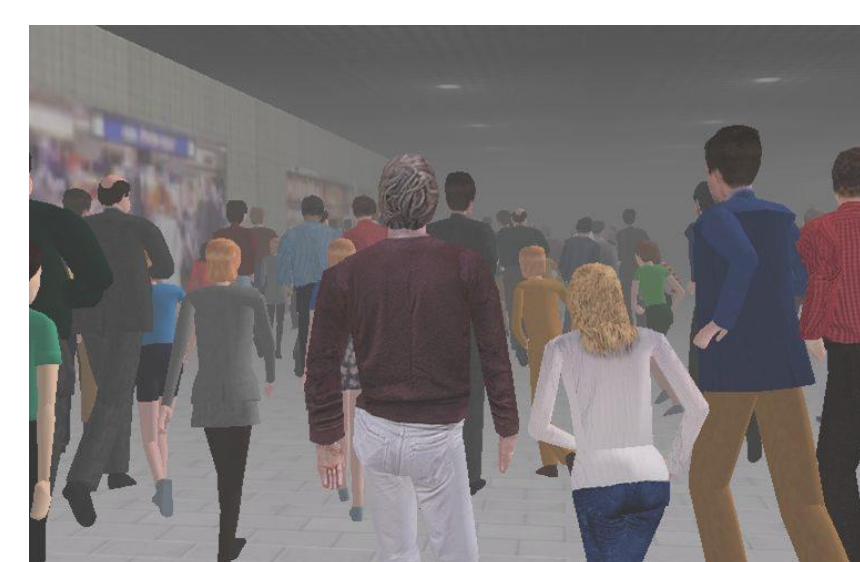
#### ■ Social promotion system for retrofitting of masonry structures

Research for the system of promoting seismic retrofitting of unreinforced masonry houses



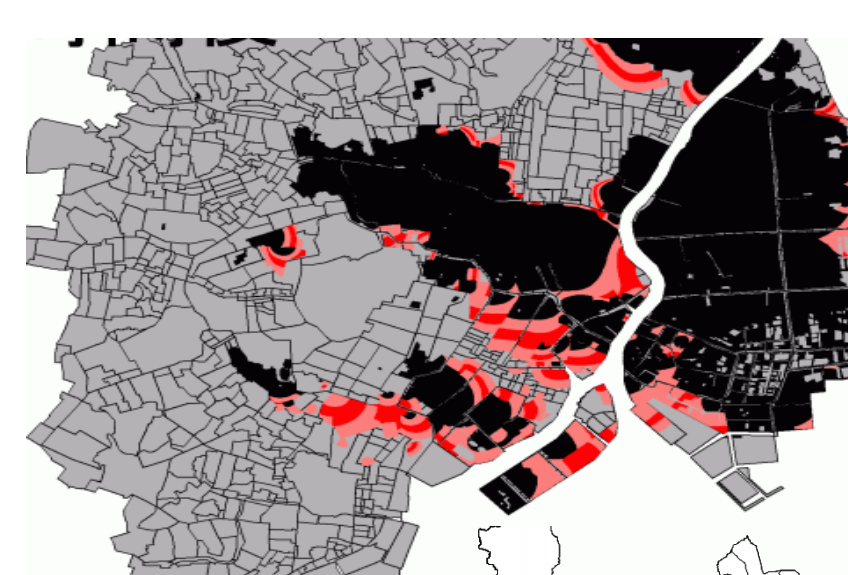
#### ■ Evacuation Behavior

Analysis of human evacuation in disaster, based on walking characteristics and building designs.



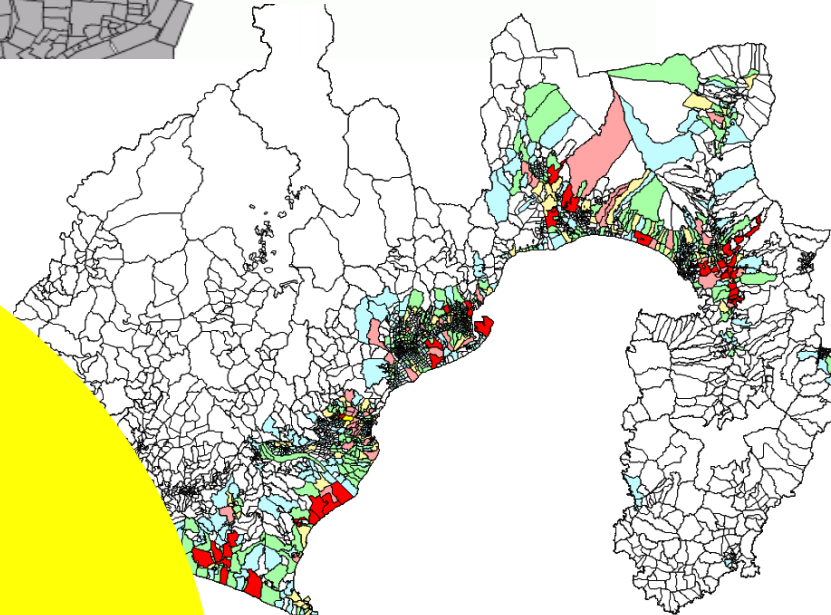
#### ■ Fire Spreading

Damage caused by fire spreading was analyzed. Figure shows the situation 12 hours after the Great Kanto Earthquake in 1923.



#### ■ Countermeasure Effect Evaluation

Research of adopting incentives for retrofitting vulnerable buildings. Effect of "Seismic Retrofitting Encouraging System", in case of Shizuoka Prefecture, was evaluated.

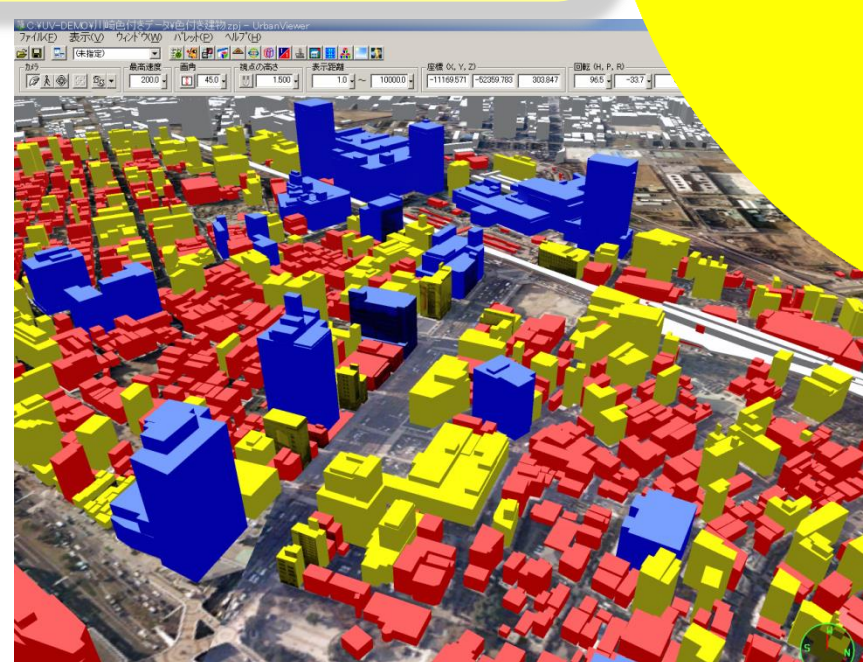


## Towards Comprehensive Disaster Management Strategy

### Disaster Information Archive

#### ■ Hazard and Disaster Risk Map

Hazard and disaster risk map for contributing comprehensive disaster management, both pre-event and post-event countermeasures



#### ■ Tsunami/Evacuation System

A tool for the general public to understand Tsunami risk and how to evacuate in case of Tsunami disaster by Integrating Tsunami simulation and human evacuation simulation



#### ■ Disaster Investigation Report

Organize, accumulate and make use of the knowledge from the past disasters.



### Collection & Dissemination of Disaster Information

#### ■ Virtual Reality Information Terminal

Create a 3D city in virtual reality and deliver information such as evacuation route.



#### ■ Next Generation Disaster Management Manual

Damage estimation and response navigation is shown by inputting earthquake information such as epicenter and magnitude, etc.



#### ■ Meguro-method/maki

A tool for improving Disaster Imagination. Create a story of your own by setting a situation around you during the disaster.

