Meguro LAB.

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

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Urban Earthquake Disaster Mitigation Engineering

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

Implementation of earthquake safer built environment

Japan has entered a high seismicity period. Within the next 30 to 50 years, magnitude 8 (M8) class earthquakes may happen 4, 5 times and M7 class earthquakes may strike 40 to 50 times in Japan. Typical one with magnitude 7 is Tokyo Metropolitan inland earthquake and those with magnitude 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 over 200 trillion yen, including 2 millions of collapsed / burnt buildings and houses. But based on the 2011 Great East-Japan Earthquake and Tsunami Disaster, the Council revised the estimation results and reported that the total economic damage would be over 300 trillion yen by magnitude 9 gigantic earthquake along Nankai-Trough (over 220 trillion yen) and Tokyo Metropolitan inland earthquake (over 95 trillion yen). The total structural damage and fatalities estimated were over 3 million and over 350 thousands, respectively.

Can you protect your important persons and things, and yourself from these earthquakes? The most important point for disaster mitigation is “How to increase the number of people who can really imagine the situation around them as time goes since the hazard attack considering regional characteristics, season, weather, and the time of occurrence of the earthquake”. An appropriate countermeasures requires disaster imagination. Our research group has established Risk Management/Integration Disaster Information System to show the disaster situation specifically based on physical and social research results.

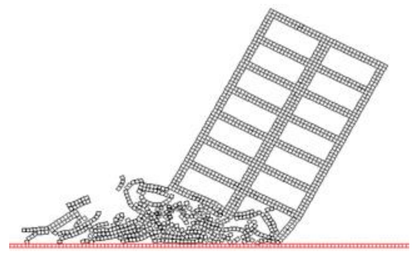
Structural measures (Hardware, Physical Analysis)

Retrofitting Method for Masonry Structures

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

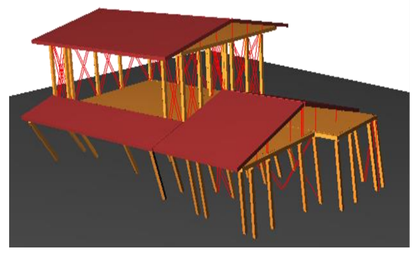
Building Collapse Analysis

Building collapse simulation using AEM which enables high-accurate analysis from continuum to non-continuum.



Housing Collapse Diagnosis

Development of seismic diagnosis method using vibration generator and DEM. Figure shows the housing collapse simulation by DEM.



Analysis of Dynamic Behavior of Furniture

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

Non-structural measures (Software, Social Analysis)

Social Promotion System for Masonry Retrofitting

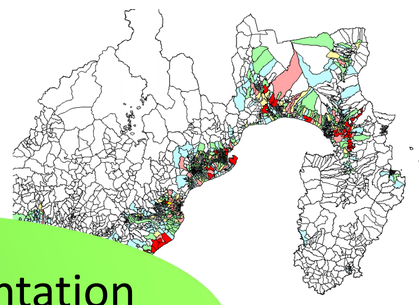
Research for the system of promoting seismic retrofitting of unreinforced masonry houses

Evacuation Behavior

Analysis of human evacuation in underground city and buildings, based on walking characteristics and building designs.

Analysis of Fire Spreading

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



Effect of Evaluation of Countermeasures

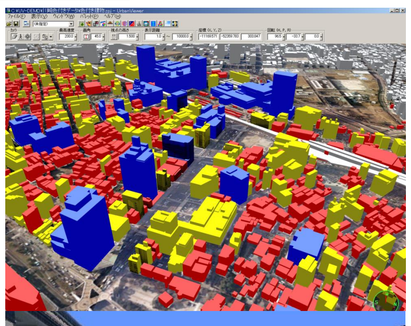
Research of adopting incentives for retrofitting vulnerable buildings. Effect of “Seismic Retrofitting Encouraging System”, in case of Shizuoka prefecture, was evaluated.

Towards Implementation of Comprehensive Disaster Management Strategy

Disaster Information Archive

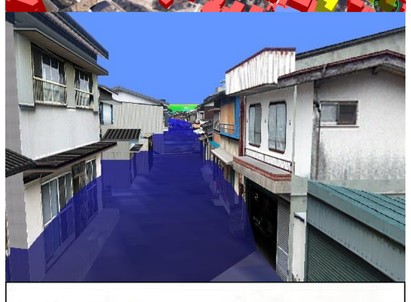
Hazard Map Management

For the management of real-time earthquake disaster prevention, damage estimation and evaluation result, hazard maps are organized and accumulated systematically.



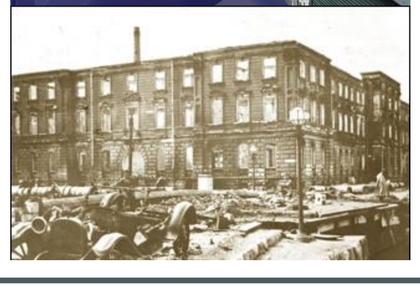
Tsunami Hazard Map

Establishment of hazard map based on pulse height observation using echo sounding. Aimed to contribute to tsunami warning system using multipurpose-buoy.



Disaster Investigation Report

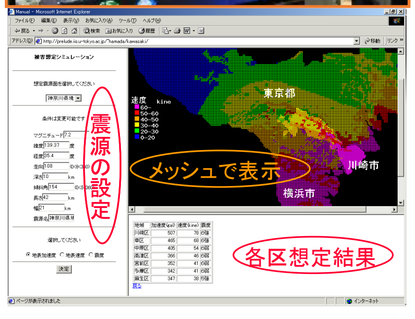
Organize, accumulate and make use of the knowledge from the past disasters.



Disaster Information Delivery

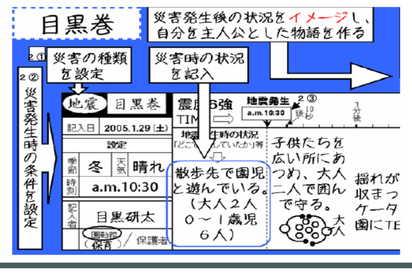
Virtual Reality Information Terminal

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



Next Generation Disaster Management Manual

Damage estimation and response navigation will be shown by inputting earthquake information such as epicenter .



Meguro-method/maki

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