

Disaster Mitigation Planning Support System based on GIS

Takaaki KATO , Dr. Eng., Urban Eng. Dept., the Univ. of Tokyo

Introduction to Disaster Mitigation Planning Support System

In this presentation, I will introduce a disaster mitigation planning support system based on GIS, which have been already used practically by some municipalities. We has developed some planning support systems in practical use concerning with disaster mitigation: Community-based urban mitigation planning support system, urban earthquake disaster mitigation and response planning support system for a local government, and urban flood disaster mitigation planning support system for a local government and citizens in vast flood plain. These are the result of collaboration with information engineers and urban planner of private companies. These systems have common system structure. One is an urban spatial database inked to GIS. The second is vulnerability assessment function or disaster simulator exemplified by urban fire-spread simulation. The last is the interface to input an alternative plan or countermeasure, by which we can input a new road plan and urban renewal plan on the system. The planning process on the planning support system consists of three steps. At the first stage, we use vulnerability assessment function and we can recognize the present problems. We set a goal against each problem corresponding with the problems. At the second stage, we use input interface and consider an alternative. This means we make the situation after taking an alternative countermeasure on the system. And then, we use a vulnerability assessment function or a simulator and check the effectiveness from the viewpoints of mitigation. After checking, we reconsider countermeasures and draw up the other alternative. This cycle will make the countermeasures refined. This is the important point of this system. As a result, countermeasures will be optimized, and we can get better or the best plan corresponding with local characteristics.

Community-based Urban Mitigation PSS

In this presentation, I focus on our community-based urban mitigation PSS. We think this system should be used by all participants in planning, which are planners, administrative officers and citizens or residents. We think this system has three roles: to make a plan and countermeasure, to share common perception of hazard or risk in users, and to communicate with all participants in this process, who are professionals including us, and citizens. This system started developing from the lessons form 1995 Hanshin-Awaji Earthquake Disaster. As you know, urban fire spread occurred in densely wooden houses packed area. Fire damage was totally about 65ha area. Many collapsed houses caused a road blockade and then prevented fire-fighting and rescue. The most lesson we learned was as urban planners is that we can ensure our safety by improvement on a scale of district, i.e. improving houses in fire resistance and earthquake resistance, making narrow streets wider, and making road network stronger, creating open space as an evacuation area and a base of post-disaster response activities. The comprehensive solution is community-based urban mitigation plan.

This planning should be based on community participation, and need to collaborate with all participants including residents. Therefore, it needs much time and much work. This is the most problem in community-based urban mitigation planning. Our proposal against this problem is the planning support system. Users of this system can understand the present situation on urban information database. Next, they can draw a plan on the system, and then analyze vulnerability of their residential area, and reconsider based on the feedback. You can see some displays of the system in other sheets attached, including distribution of houses structure, houses age and width of streets as the present situation, fire-spread simulation results as damage estimation, and as a tool for building renewal planning, road planning and create open-space. I show a case to apply new regulation that new building must be fire-resisting or fire-proof in other sheets attached and demonstrate that fire damage will reduce. If you practice operation, you can draw a plan like this in only 10 minutes and check the effectiveness immediately. I show the actual case of planning workshop with residents in Osaka. They combined the various tools as discussion, PSS, a map, and field work, and considered their future home town. We will experience the actual case, and find points to improve, and we will challenge technically. For example, I think making precision of simulation improve, or using 3D data. If you want to know in detail, please visit the formal Home page, <http://www.bousai-pss.jp>.

Prospect

I think the planning support system based on GIS will contribute to mitigate vulnerability of a city and ensure safety for citizens not only in Japan but also in Peru. Therefore, I hope that we will discuss potential of planning support system from the various viewpoints with our eyes set on practical use in this Peru-Japan research collaboration.

Appendix

I would like to introduce myself. I belong to urban engineering department. My field is not earthquake engineering, but urban planning from the viewpoint of disaster mitigation. In my research activities, I have two different approaches. One is extreme practical approach. in this approach, I work like an administrative officer, or an urban planning consultant. I sometimes discuss community-based urban planning with the residents of a district, or sometimes collaborate on a plan or a practical research with administrative officers. The other approach is theoretical. Main themes are vulnerability assessment and damage estimation methodology, especially ones of urban fire spread. I prefer mathematical method and I sometimes apply theory of physics such as percolation theory to our fields. My academic characteristics are in this balance of two approaches.

