

Tsunami Evacuation Simulation Considering Building Collapse and Fire Spread

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Japan is one of the world's leading disaster-prone countries, and has an extremely high frequency of natural disasters such as earthquakes, tsunami and typhoons. Regarding the Great East Japan Earthquake in 2011, it had been found that there is a limit to disaster prevention measures on the hardware aspects such as construction of breakwaters. And the importance of the software measures was confirmed. As one of the software measures, each municipality has been preparing hazard maps. However, hazard maps make it difficult to understand when and how to evacuate. Thus, research on evacuation simulation, which can show the above at a glance, has been widely conducted in recent years.

The present authors have also developed a tsunami evacuation system using multi-agent models. However, not only tsunami but also building collapse and fire spread have a significant impact on evacuation behaviours and survival rates of refugees as secondary damages of earthquakes.

Therefore, the purpose of this study is to develop a tsunami evacuation simulation system that considers building collapse and fire spread. The road blockage is determined by calculating the probability of road blockage due to building collapse, taking into account the scale of the assumed earthquake, the location of buildings, and the type of building [1]. For fire spread simulation, an existing simulator [2] based on the fire spread rate equation is used. Under the condition of average wind direction and wind speed in the target area, the fire spread is represented by setting any fire point and using the fire time of each building obtained by the simulation. The present system is applied to several examples to demonstrate the validity and effectiveness of the system.

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