Development for the Damage Prediction Data of Earthquake Disaster

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ABSTRACT: Tohoku Earthquake that occurred on 11 March 2011, resulted in severe damage to the area wide range of Tohoku and Kanto In Japan, a major earthquake has been estimated to occur in the near future. In order to reduce damage caused by a widespread disaster of an earthquake, it is necessary to develop quantitative and high-resolution method that can be used in any different map scale to evaluate the current anticipated damage. Today, however, the essential data, which required to estimate the precise damage to each building throughout Japan by an earthquake is not fully available. In addition, they are often owned and disclosed on a limited basis by local governments. Therefore, In this study, we develop an automated method for estimating the structural type (wood-frame or non-wood-frame), the fire-resistance performance (fire-proof, semi-fire-proof, or fire-preventive) and the age of buildings using the Housing and Land Survey (Ministry of Internal Affairs and Communication), the digital telephone directory with longitude and latitude called "Telepoint Data" (Zenrin Co., Ltd.), and residential maps ("Zmap-TOWN Ⅱ" by Zenrin Co., Ltd.). These data cover t almost all area of Japan. Residential maps and the Telepoint Data can understand the information for each building (number of floors, area, and usage). In addition, polygon data of the commercial accumulation statistics (CAS) are used to estimate fire-resistance performance based on whether or not each building is located in a commercial area. The distribution of structural types and fire-resistance performances for each building are deeply dependent on land-use zoning, as some zones are established as firebreaks, called "firebreak zones". Polygons of land-use zoning do not exist throughout Japan, but many polygons of CAS are designated to control firebreak zones. Moreover, we used zone polygons of Densely Inhabited District (DID) published by National Land Numerical Information to estimate the age of each buildings. In addition, our data is cross-checked to verify the reliability of our method. Finally, using a method developed by Akiyama et al. (2013) to estimate the information on residents in each building, we estimate the risk of fatalities and create a database that can evaluate the relative risks between different regions. There are three advantages to our method. First, our method can be applied to any aggregate unit, and can evaluate physical and fatalities risk from fires and building collapses caused by earthquakes throughout Japan. Second, most of our data processing is automated so that we can deal with a large amount of data such as national-scale data. Finally, our method makes it possible to compare the damage risk of earthquakes on a national scale by arranging national-

scale data and finding relatively more vulnerable regions by using same index. As a result, we believe that risk communication between municipalities will be promoted, and it will be easier to make optimum decisions to reduce damages, than before.

KEY WORDS: structural type, fire-resistance performance, age of buildings, micro simulation, risk of fatalities