Development of Technology to Instantaneously Estimate Large-scale, Wide-area Earthquake Damage

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1. Introduction

Facilities of the Ministry of Land, Infrastructure, Transport and Tourism are managed when a disaster occurs by conducting inspections to clarify their condition, but after a large-scale earthquake, this requires many hours, possibly impeding decision making concerning the rapid first response.

Therefore, we have built the Instantaneous Earthquake Damage Estimation System (below, "the System") by developing technology to instantaneously estimate the damage caused by a large-scale wide-area earthquake in order to support decision making by facility managers at the stage when little information is available immediately after the earthquake.

2. Instantaneous Earthquake Damage Estimation System

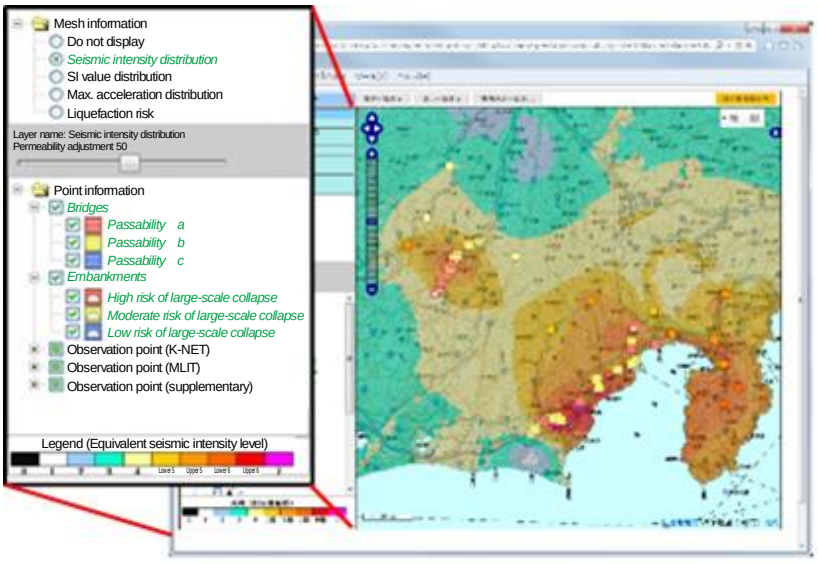
To estimate the facility damage caused by the shaking of an earthquake, it is necessary to know the earthquake motion strength at the location of the facility. This system estimates the spatial distribution of earthquake motion strength on the ground surface by considering amplitude based on earthquake motion strength at the ground surface according to the surface layer ground based on records from multiple observation points. The amplitude of the earthquake motion according to the surface ground is obtained by calculating the amplification factor using formulas etc. proposed by past research, based on the publicly announced average S-wave velocity of the surface ground. At the same time, for locations of high strength earthquake motion, the method was improved to consider the impact of liquefaction of the surface ground.

Damage to structures estimated by this system is done for viaducts and embankments. And the danger of liquefaction of ground that would highly impact facility damage is also estimated. Road embankments in particular, were analyzed based on cases of damage caused by the 2004 Niigata Prefecture Chuetsu Earthquake and by the Great East Japan Earthquake of 2011, clarifying that the foundation ground conditions, embankment structure, and embankment height are strongly correlated with the degree of damage, improving the precision of damage estimations.

A trial system built based on the achievements of the research is being operated, and the following figure shows an image of its screen.

A study is being conducted to achieve practical use of this system at disaster response sites, and a series of interviews and exchange of opinions have been carried

Figure Trial System Screen of the Instantaneous Earthquake Damage Estimation System



out in regional development bureaus. Following the opinions from the field, we have developed and equipped the trial system with functions to assess priority of road passibility and to permit use linked to a CCTV camera.

3. Looking ahead

As stated above, in response to opinions heard at regional development bureaus, a trial system will be built with, in addition to the basic functions such as displaying earthquake motion distribution and damage estimations, a number of functions to support decision-making in the event of a disaster.

In the future, based on the trial system, we plan to gather more spirited opinions from the field and to popularize its use for disaster response by regional development bureaus.