

# Development of a System for Grasping the Damage Situation of Highway Bridges Based on the Damage caused by the 2016 Kumamoto Earthquake

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## 1. Introduction

In the recovery activities after large-scale earthquakes, such as earthquakes occurring directly beneath the Tokyo metropolitan area, and the Nankai Trough earthquake, it is important to eliminate road obstacles immediately and efficiently. So far, we have analyzed the traffic failures on bridges affected by the 2011 earthquake off the Pacific coast of Tohoku, conducted full-scale experiments and monitoring of actual bridges, and verified the accuracy of the settlement of the earth filled at the backside of abutments using an inexpensive displacement meter.<sup>1</sup> Based on the results, we developed a damage situation grasping system that grasps the earthquake damage situation and traffic failure on highway bridges efficiently without fail as overall information. This system is installed and operated on a trial basis on nine bridges as trial operation fields.

## 2. Improvement of the Damage Situation Grasping System

In the 2016 Kumamoto earthquake, the earthquakes that measured the maximum 7 occurred in succession on April 14 and 16 and caused tremendous damage to highway bridges. As the damage caused by these earthquakes, the movement and displacement of the superstructure of bridges, damage to bridge abutments and piers, damage to shoes, and damage to displacement limit devices, etc., occurred. Since it is too difficult to grasp the degree of damage required to determine the possibility with the existing system shown in Figure 2, it is necessary to make improvements to grasp the damage situation of bridge piers, shoes, and bridge collapse prevention systems, etc.<sup>2</sup> As a result of considering a system to grasp the degree of damage, we installed not only conventional displacement meters but also clinometers, miniature cameras, and vibration meters as shown in Figure 2 on another four bridges in Kumamoto and Oita after the Kumamoto earthquake occurred and are now verifying the validity of the thresholds for observation accuracy and anomaly detection.

## 3. Future Efforts

It is expected that the development and widespread use of new technologies and materials will progress day by day, and they will be introduced into the field of road management. In the future, we will conduct considerations that contribute to the establishment of verification methods used when utilizing new technologies and materials in road management. In

addition, we are also planning to continue the observation of the trial operation fields and improve the method for providing damage information according to the needs of road administrators toward practical use.

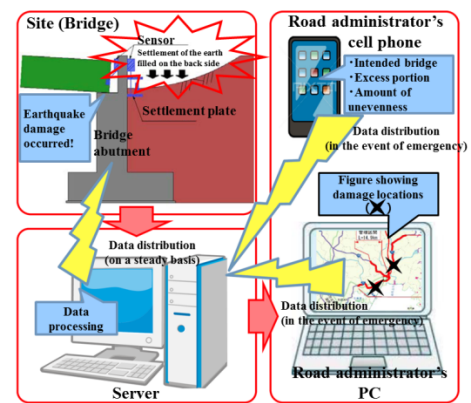


Figure 1 Outline figure of the highway bridge damage situation grasping system



Figure 2 Bridges that were newly installed (Upper photos) and sensor installation examples (lower photos)

## [References]

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