Seismic response simulation of the large-span bridge of HANSHIN expressway by a hypothetical great earthquake

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Objectives

It is required that urban expressway sustains the road function as emergency transportation routes after the great earthquake such as Nankai Trough quake which is estimated to occur in near future. Therefore, securing the traffic safety is very important and it becomes necessary to evaluate an urban expressway as a road network exactly in the future. In this study, we tried to conduct the large-scale seismic analysis of the large-span bridge which extremely has difficulty in restoration to obtain the real dynamic performance of the route as lifeline.

Outline of Results

We carried out seismic response analysis on K computer for the large-span bridges in the Osaka coastal line. We modeled it by the non-linear shell element to express the behavior of the constitution material for the large-span bridge up to the destruction. It was a large-scale analysis model and was not able to analyze it with the normal computer. Therefore we showed seismic response analysis method of the parallel calculation by DDM (Domain Decomposition Method) suitable for the large-span bridge and really carried out analysis on K computer. As a result, we were able to evaluate the damaged member and its damage level in detail in the large-span bridge when an unexpected huge earthquake greatly exceeding a seismic design force occurred. From this analysis we confirmed that large-scale seismic response analysis at the route including the large-span bridges is feasible using K computer.