

Numerical Model Updating Technique for Estimating Load Carrying Capacities of High Speed Railway Bridges

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Summary

The load carrying capacities of railway bridges should be periodically evaluated due to its social significance. Especially, load carrying capacity evaluation for a high speed railway bridge is more needed because of nasty accident. Numerical analysis can be a good tool for evaluating load carrying capacity instead of field test which has limitations such as traffic control, weather conditions, and economic problem. For reasonable evaluating load carrying capacity, numerical model should be reliably updated with accurate measured data. In this study, combined phase model updating technique based on univariate search method was used for model updating. And measuring point roaming method was used for meticulous measurement with limited number of sensor. As a result, it was possible to get similar response from numerical experiment with ambient vibration response from existing bridge. The updated model could be used for estimating load carrying capacity of a bridge.

Keywords: Load carrying capacity; High speed railway-bridge; Numerical model updating; Measuring point roaming method; Ambient vibration.

1. Introduction

A railway-bridge should be maintained by periodical investigation due to its social significance in traffic and distribution etc. Especially, bridges for high speed railway over 300 km/h should be strictly maintained because a nasty accident or serious second damage can be occurred by its speed.

In a maintenance for railway-bridge, load carrying capacity estimation which can be directly used for evaluating bridge state is one of most important items. Normally, load carrying capacity of a railway-bridge is estimated with the measured data from loading test in field. However, it is hard to frequently do loading tests in field due to limitations such as traffic control, weather condition, economic limitation, etc.

A Numerical experiment can be a good solution for evaluating load carrying capacity instead of field loading test. Measured data from field test is although needed to numerical model updating for accurate numerical experiment, ambient vibration test can be enough to get important information for numerical model updating. In this study, load carrying capacity is estimated by numerical experiment result with updated model by combined phase model updating technique[1] based on univariate search method.[2] Meticulous measurement for consideration with accurate numerical model updating and limited number of sensor was possible by measuring point roaming method [3].

As a result, it was possible to get similar response from numerical experiment with ambient vibration response from existing bridge. Also, it was possible to estimate load carrying capacity of a high speed railway-bridge.