Investigation of the validity of long-term bridge health monitoring utilizing Mahalanobis Distance and Bayesian approach

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【Background】

Bridge health monitoring (BHM) focusing on the change in dynamic property of the bridge is widely recognized as an economical and effective technology that aids decision-making for bridge maintenance. In the practical application of long-term BHM, one of the difficulties is that the observed vibration data include environmental influences.
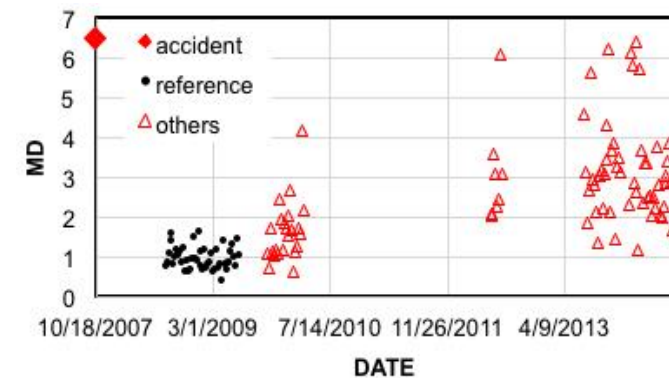
【Objective】

This study investigates the validity of two approaches, Mahalanobis distance (MD) of modal parameters and Bayesian approach, for long-term bridge monitoring.

【Approach】

The Mahalanobis distance (MD) and Bayes factor are both adopted to emphasize potential changes in the identified modal properties in the two approaches. During both approaches, influences of change in temperature and variation in passing vehicles were got rid off with regression methods. With monitoring data taken from an in-service bridge, the two approaches' validity were investigated. The results are shown on the right side. Both results demonstrated that the possibility of changes in structural integrity of the bridge is very low, as well as the potentials of being useful in long-term BHM of both approaches.

【Results】

MD of both frequencies and damping constants

Updated Bayes factor w.r.t. time