Bayesian model updating based on MCMC simulation algorithm

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Keywords: Model updating

【Background】

Today, the maintenance of numerous large-scale bridges has become a crucially important issue. Structural health monitoring (SHM) has developed to become one of the most efficient methods to provide useful information for maintenance, mainly including damage detection, damage localization, and prediction of structural response. Model updating, a combination of field testing and numerical models, has become a rapidly developing trend of SHM in the field of civil engineering. Nevertheless, few reported studies have examined vibration-based model updating for the damage detection of real structures, particularly for real bridges.

【Objective】

To investigate a efficient and reliable model update algorithm
To discuss feasibility of damage modeling in damage detection
To obtain accurate models by structural model updating method for damage detection

【Approach】

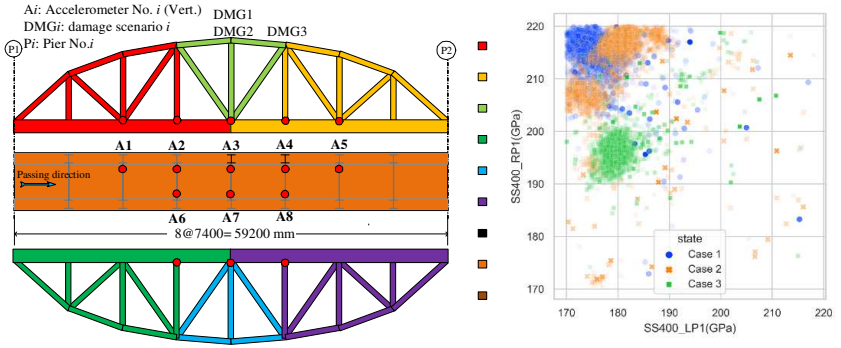
Firstly, damage of structures is definable as changes that can adversely affect system performance. Therefore, damage detection can be turned into a problem to identify changes in structural integrity between different states. Then, the updating method is applied to each state of system. The damage state of the structure can be detected by comparing the update parameters using the model updating method.

【Publication plan】

- EVACES 2021
- A journal paper

【Results】

The model updating scheme of the Ada bridge is shown as the left figure. The part of samples in each case are shown in the right figure. The table presents the MPV of the parameters in each case.



Case	LP1	RP1	LM	RM	LP2	RP2	MU	MD	RC	spring
1	171.89	217.72	206.98	171.27	170.30	195.19	227.76	234.98	18.33	2.23E9
2	174.92	214.07	215.82	178.33	179.70	192.98	241.46	193.29	19.86	2.72E9
3	181.04	195.13	171.55	200.65	181.78	188.38	206.96	166.53	25.36	9.15E9