



Damage detection based on Null-subspace analysis

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【Background】

Traditional modal parameters-based damage detection methods are not sufficiently sensitive to reflect damage levels, even including the loss of prestress of PC bridges. What's more, it's hard to comprehensively analyze all the modal parameters to judge whether the structure is healthy or not when real-time SHM. Therefore, a more practical damage index should be proposed and utilize it to reflect the reliability of the monitored structure.

【Objective】

This study aims to find a method that is sensitive to the damage levels of structures and easy to analyze for the purpose of real time SHM. In addition, a Bayesian framework of damage indicators is needed for reliability analysis.

【Approach】

Starting from the point of subspace analysis, a damage detection method based on Null subspace analysis is proposed. After that, a Bayesian framework is treated on the indicator, utilizing new coming measurements, the PDF of the damage indicator is updated by the time. The Bayesian framework can also be used to other damage indicators, therefore it is possible to conduct a comprehensively analysis of health state of the structure by comparing the results of different damage indicators.

【Publication plan】

- ICOSAR, 20-24 June, 2022, Shanghai.

【Results】

A damage indicator derived directly from the Hankel matrix can reflect the damage state of the structure, and by Bayesian updating the PDF of damage indicator in the reference state, it shows more clear tendency change, and may be used to quantitatively analysis of the reliability of the structure.

