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基于叠加曲率模态改变率的梁结构损伤诊断

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DAMAGE DIAGNOSIS OF BEAM STRUCTURES BASED ON SUPERIMPOSED CURVATURE MODAL CHANGE RATE

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摘要

通过理论分析证明曲率模态差指标存在两个不足：一是对曲率模态节点处损伤不够敏感，二是不能有效反映损伤程度。对曲率模态差指标进行改进，提出叠加曲率模态改变率指标，理论上克服了原指标的不足。采用连续梁算例进行对比验证，结果表明新指标能够同时反映损伤位置和损伤程度，较曲率模态差指标更加优越。最后提出了基于新指标的单元损伤因子估算方法并验证了有效性。

关键词： 梁结构 损伤检测 曲率模态差 叠加曲率模态改变率 模态节点

Abstract:

Two deficiencies of the curvature modal difference (CMD) index are firstly proved through theoretical analysis. One is that the CMD index is insensitive to damages occurring at curvature modal nodes and another is that the CMD could not reflect damage degree effectively. Then a new improved index called superimposed curvature modal change rate (SCMCR) is proposed in this paper, which can overcome the deficiencies of the CMD index theoretically. A continuous beam is selected as a numerical example and the results show that the SCMCR index could reflect both the location and degree of damage | it is superior to the CMD index. Finally, a method for estimating damage factors based on the new index is proposed and validated.

Key words: beam structure damage detection curvature modal difference superimposed curvature modal change rate modal node

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