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Assessment of Mode Shape-Based Damage Detection Methods under Real Operational Conditions

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The application of vibration-based damage detection methods to a wind turbine model is analyzed in this paper. The target is to develop a system that detects and locates damage on a structure subjected to wind excitation. With the proposed procedure vibration data is first processed by an Operational Modal Analysis. The extracted mode shapes are subsequently evaluated by two damage detection algorithms: the Modal Strain Energy method and the Gapped Smoothing Technique. Different types of damage are investigated, including tower damage and a change of foundation stiffness. First, a numerical prestudy is conducted to give information about suitable measurement quantities and density of measurement positions on the structure. Based on the numerical results an experimental setup is arranged, including the equipment of the tower with strain gauges and accelerometers. The results of the experimental work show that locating damage with the proposed approach is feasible.

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Ключевые слова:

Содержание

Abstract
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Approach for structure monitoring
Investigated structure
Numerical prestudy
Experimental evaluation
Conclusion