Automated Modal Identification of Operational Wind Turbines Blades

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Key Words: Structural Health Monitoring, Wind Turbine Blades, Environmental and Operational Variability, Modal Analysis

ABSTRACT

This study proposes a continuous-time automated operational modal analysis approach for conducting system identification of wind turbine blades. A vibration-based monitoring system consisting of low-cost microcontrollers and acceleration sensors was designed and deployed in a reduced scale wind turbine mock-up. Vibration data was collected during a long period of time under different environmental and operational conditions and considering several artificially induced damage scenarios. The combined deterministic-stochastic subspace identification method and clustering techniques were used to automatically identify the modal parameters of wind turbine blades. Natural frequencies, damping ratios, and mode shapes of several modes were successfully identified, and the effects of temperature, rotating speed, added masses, and damage conditions on the identified modal parameters are comprehensively discussed.