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Recent advances in wind turbine technologies and sensing for structural health monitoring

A significant amount of interest exists in performing wind turbine structural health monitoring, characterization, and evaluation. The presentation highlights some recent advances in optical sensing, acoustic methods, infrared, UAV sensing, and radar technologies that can be applied to characterize wind turbine structural health, structural dynamics, damage, and embedded defects. Non-contacting, full-field surface dynamic measurements are presented that leverage three-dimensional (3D) digital image correlation (DIC), point tracking (PT), and motion magnification methods. The approaches are able to obtain full-field geometry data, in three dimensions. Information about the change in geometry of an object over time can be found by comparing a sequence of images and virtual strain gages (or position sensors) can be applied over the entire visible surface of an object of interest. Non-contact structural dynamic information can be extracted. Results from the structural interrogation of acoustic monitoring, infrared sensing, and radar sensing are also presented on a variety of test objects. Several examples of various sensing technologies are presented on wind turbine rotors and blades. Additionally, some recent advances in wind energy research that originated within the National Science Foundation-Industry/University Cooperative Research Center for Wind Energy Science, Technology and Research (Windstar) will be presented.

Biography

Niezrecki is Professor and Chair of Mechanical Engineering at the University of Massachusetts Lowell, the Co-Director of the Structural Dynamics and Acoustics Systems Laboratory (<http://sdasl.uml.edu/>), the Director of the Center for Wind Energy at UML (www.uml.edu/windenergy), and also the Director of the National Science Foundation-Industry/University Cooperative Research Center for Wind Energy Science, Technology and Research (Windstar). He has been directly involved in structural dynamics, acoustics, smart structures and materials, and sensing research for over 23 years, with more than 100 publications. He has conducted over \$11M USD of sponsored research through grants from numerous federal and state agencies as well as several companies.

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