

Title: Intelligent Diagnostics and Prognostics of Machinery Systems

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Abstract:

Reliable real-time condition monitoring systems are critically needed in industries to recognize initial equipment defects so as to improve production quality, operation efficiency and safety, but to reduce costs. An intelligent monitoring system consists of modules such as data acquisition, signal processing, diagnostics and prognostics. In real-world industrial monitoring applications, smart sensor-based data acquisition systems should be used to collect signals wirelessly. Signal processing is a process to extract representative features from measurement for system analysis and fault detection in machinery units such as gears and bearings. The related signal processing techniques should be robust to noise and sensitive to health associated features. Diagnosis is a procedure to classify features/patterns into different categories corresponding to different equipment health states. New soft computing tools such as evolving neural fuzzy methods have been used in automatic diagnostic classification. Prognosis is a process to forecast future states of a dynamic system for remaining useful life prediction. Appropriate machine learning algorithms can be used to improve decision-making convergence and adaptive capability to accommodate different machinery conditions.

This speech will discuss the research and development in these areas, the related challenges and possible solution strategies.

Keywords: Machinery health condition monitoring, fault diagnosis/prognosis, predictive maintenance, signal processing, intelligent tool.



Wilson Wang received his BSc in Electromechanical Engineering (SIT in China), MSc in Mechanical Engineering (Northeastern University in China), MEng in Industrial Engineering (University of Toronto in Canada), and PhD in Mechatronics Engineering (University of Waterloo in Canada) in 2002. From 2002 to 2004, he was a Senior Scientist/Project Manager at Mechworks Systems Inc. in Ontario, Canada. He joined Lakehead University (Thunder Bay, Canada) in 2004, where he is currently a Professor in the Department of Mechanical Engineering. His research interests include signal processing, artificial intelligence, diagnostics, prognostics, mechatronics, and smart machines. Dr. Wang is a fellow of International Society of Engineering Asset Management, and a Lakehead Research Chair. In the past ten years, he has supervised more than highly qualified personnel (PDF, PhD and MSc), about published about 200 articles (in the related academic journals and conferences). He has also successfully developed a series of smart systems for online diagnostics and prognostics of rotary mechanical and electrical machines.