Condition Monitoring and Decision Making for Systems with Variable Usage Patterns

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Abstract

Condition Based Maintenance (CBM) has been successfully adopted in many industries, particularly in manufacturing processes where condition monitoring (CM) is well-established (e.g. vibration monitoring). In these applications, system usage patterns are typically consistent so that changes the signals may be attributed to changes in condition alone. However, many modern systems often have highly-variable usage (e.g. automobiles) affecting the signals used for CM. These changes may result in false alarms or masking of anomalous behavior under certain usage patterns. In addition, constant-usage CM methods offer no insight into how operational decisions and other inputs affect the performance and life of the system. In this talk, regime-specific, model-based CM methods are introduced to address the variable usage patterns. Their efficacy is demonstrated on two systems: automotive engines and a semiconductor manufacturing tool. Enabled by these methods, two frameworks for condition-based optimization are presented along with some key developments and remaining challenges to their realization.
About the Speaker

Michael E. Cholette is a Lecturer in Mechanical Systems and Asset Management at the Queensland University of Technology in Brisbane, Australia. He received his B.S. degree from the University of Michigan in 2007 and his M.S. degree from the University of Texas at Austin in 2009, both in Mechanical Engineering. He received his Ph.D. from the University of Texas at Austin in August 2012 in Dynamic Systems and Control. His research interests include diagnosis and prognosis of machines and their role in maintenance planning and reconfigurable control. His research has been funded by the US National Science Foundation, the International SEMATECH Manufacturing Initiative, the Australian Research Council, and numerous Australian industrial partners.

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