Vibration based Condition Monitoring of Dynamical Systems

Abstract

Condition monitoring of vibrating systems is a very popular area of study in mechanical, civil and aerospace engineering applications. The premise of condition monitoring is based on an understanding of vibration data and making sense of the patterns that come out of it to finally decide whether a vibrating system is functioning normally or not. One of the important steps towards condition monitoring of dynamical systems involves estimation of normal modes of a multi-degree-of-freedom (MDOF) vibrating system from acceleration data. In this talk, one of the more recent approaches from statistical signal processing named "blind source separation" is presented along with its mathematical foundations, simulation examples and implementation to field data. Moving on from blind source separation, a simplified formulation of recursive eigenvalue decomposition towards practical real time practical structural health monitoring problems is presented as the implementation of real time 'blind source separation' still remains a challenge. The concepts and mathematical developments are supplemented with numerical examples, laboratory case studies and field implementations.