

Title: On Condition Monitoring, Fault/Damage/Attack Diagnosis and Tolerant Control with Applications to Renewable Engineering Systems and Smart Grids

Abstract:

Condition monitoring, fault diagnosis, and fault-tolerant control (FTC) in traditional safety-critical systems, such as airplanes, nuclear power plants, chemical plants and cars etc., have been progressively and extensively investigated worldwide since the 1970's. However, the two catastrophic accidents induced by the crashes of two Boeing 737 MAX8 airplanes in 2019 have highlighted again the necessity and urgency for fault diagnosis and FTC research & development. In power engineering field, the famous blackout that shut down the power in many of the American northeast areas in 2003 and recently occurred cyber attacks on the power systems have also promoted the research and development on renewable energy and smart grids as well as their safety and security issues in recent years. Electrical microgrids with sustainable distributed power systems, in particular, wind and solar powers, are essential to provide services that are reliable, cost-effective, and environmentally responsible. One of key techniques for ensuring the viability and effectiveness of microgrids is to make use of advanced condition monitoring and FTC techniques at all levels of power generation, integration into grid, and distribution through networks, and also the recent trend for handling cyber attacks in such type of cyber-physical systems. In this talk, a brief overall view on the challenges and latest developments on condition monitoring, fault/damage/attack detection and diagnosis (FDD), fault-tolerant control (FTC), and fault-tolerant cooperative control (FTCC) in wind turbines, wind farm, solar panels, and microgrids are given first. Our latest research works on the above-mentioned subjects will then be introduced as examples among extensive works in the field.