ELECTRICAL ENGINEERING SEMINARS

كلية الهندسة
College of Engineering
QATAR UNIVERSITY جامعة قطر

The Department of Electrical Engineering cordially invites you to a seminar on

Diagnosis, Prognosis and Health Monitoring of Gas Turbines and Network of Autonomous Unmanned Systems

By

Dr. K Khorasani

Date: Monday, December 10, 2012

Time: 11:00am to 12:00pm

Venue: Male Engineering Building G - 209

Speaker's Bio:

K. Khorasani received the B.S., M.S., and Ph.D. degrees in Electrical and Computer Engineering from the University of Illinois at Urbana-Champaign in 1981, 1982 and 1985, respectively. From 1985 to 1988 he was an Assistant Professor at the University of Michigan at Dearborn and since 1988, he has been at Concordia University, Montreal, Canada, where he is currently a Professor and Concordia University Tier I Research Chair in the Department of Electrical and Computer Engineering. He has authored/co-authored over 350 publications and supervised to completion of over 95 Ph.D., Masters, and Post-doctoral fellows. His main areas of research are in nonlinear and adaptive control, intelligent and autonomous control of networked unmanned systems, fault diagnosis, isolation and recovery (FDIR), diagnosis, prognosis, and health management (DPHM), satellites, unmanned vehicles, aerospace systems, neural network applications to pattern recognition, robotics and control, adaptive structure neural networks, and modeling and control of flexible link/joint manipulators.

Abstract

In the first part of this talk I will provide a brief overview on the main research challenges and directions that we have pursued in recent years on development and implementation of new integrated approaches for diagnosis, prognosis, and health management of gas turbine engines. The envisaged hybrid methodologies are based on an "optimal" integration of model-based and computational intelligence-based techniques to monitor, diagnose, predict failures and estimate remaining useful life to maximize engine's availability and minimize the overall life cycle cost. The envisaged solutions and methodologies are to overcome the limitations of standard trend estimation techniques by intelligent, adaptable fusion of information through developing and utilizing: (a) novel diagnosis, prognosis, and health management algorithms based on the integration of computational intelligence approaches, i.e. learning-based paradigms and model-based approaches into a hybrid architecture for a unified solution, (b) multi-disciplinary solutions to exploit large amounts of field data to provide information to engineers more efficiently with feedback and enhancements to the design process; and (c) intelligent and adaptive strategies to provide more detailed and relevant information about fault events to significantly impact the operation and maintenance actions.

In the second part of the talk the main research challenges and directions that we have pursued in recent years on cooperative control and fault diagnosis of networked autonomous unmanned systems are presented. An autonomous, collaborative and intelligent-based complex network of unmanned systems although are locally interacting but are capable of demonstrating complex team behavior. The unmanned systems network should be reliable and robust in the sense that it should autonomously have the capability to intelligently reconfigure, self-organize and redeploy its assets subject to unexpected modifications to their architecture and topology. The envisaged system should be designed efficiently to have low resource communication and computational requirements, implying that the unmanned systems assets could be scaled up readily with few constraints on the system size. The key critical issues that we have been investigating are development of formal and rigorous distributed, decentralized, and optimized methodologies for an optimal network management utilizing autonomous and intelligent based command and control theories that are constrained by the communication network and computational resources. Our goals are to develop innovative and novel concepts, techniques, and solutions to meet stringent objectives and requirements that are envisaged in an unmanned system network for determining the optimal management, control, minimization of exchange and latencies of information subject to real-time deadlines by the decision makers to guarantee optimal mission performance.