



The
University
Of
Sheffield.

Automatic
Control and
Systems
Engineering

The Department of Automatic Control & Systems Engineering
is pleased to announce the following seminar:

Fault Tolerant Control from an Application Perspective

Professor Ron J Patton

*School of Engineering, Faculty of Science and Engineering
University of Hull*

Wednesday, 29 October 2014 at 14:00

LT02, Sir Henry Stephenson Building

Abstract

Conventional feedback control designs may result in unsatisfactory performance and stability in the event of component malfunctions or faults. Hence, fault tolerant control (FTC) systems are being developed which are capable of maintaining acceptable system integrity and performance subject to faults and failures with applications to a wide range of engineering systems, from vehicles and aerospace, marine systems, mechatronics, electric power (generation and distribution), offshore wind technology, chemical processes and bio-medical applications involving control.

Even after more than three decades of research FTC remains today a mainly research topic. The driving research challenge is to produce architectures and methods that are attractive for technology transfer with serious intention for practical end-user added value.

Fault-tolerance and also robustness in control can only be traded with performance. The FTC goal is to maintain functional integrity, reliability, stability and admissible performance. Typically the required goal may be achieved through (1) control robustness, (2) fault compensation/accommodation or (3) through system redundancy and reconfiguration. But the main question is how should these concepts be combined?

This goal to achieve admissible performance in the midst of complexity and subject to a limited set of system component fault conditions is certainly an advanced multi-objective requirement that is not achievable using the simpler fixed controller passive approaches to FTC. Hence, current research is concerned with architectures and advanced control and estimation methods calling on recent developments throughout the advanced control and decision literature. The emerging challenge is to accommodate the controller such that there can be a guarantee that the closed-loop system has "admissible behaviour" subject to an expected repertoire of faults.

In view of these developments this presentation has *two* goals. The first is to provide a brief review of recent research on FTC, focusing on research output that has created significant impact, particularly during the period 2000 to 2014. The second goal is to outline the emerging directions and to map out future perspectives in research that can be of value to end-user practitioners as well as the academic control and systems engineering communities.

Biography

Ron J. Patton graduated at Sheffield University with BEng, MEng and PhD degrees in Electrical & Electronic Engineering and Control Systems, in 1972, 1974, and 1980, respectively. He has held a number of posts in industry and universities. He was leader of Control Research at York University, UK [1981-1994]. Ron holds the Chair in Control & Intelligent Systems Engineering at Hull University [1995-]. He has made a substantial contribution to the field of modelling in fault diagnosis and the design of robust methods for FDI/FDD (fault detection and isolation/fault detection and diagnosis) and fault-tolerant control (FTC) in dynamic systems as author of 348 papers, including 114 journal papers and 6 books. From 1995 Ron initiated and led the fault-tolerant control theme group in the European Science Foundation project Complex Control Systems - COSY. Ron was member of the EPSRC peer review college [1995-2005]. Ron served on the Editorial Board of Control Engineering Practice [1995-2005] and is currently on the Editorial Board of the International Journal of Applied Mathematics and Computer Science. He is Subject Editor in System Supervision: Fault-tolerant Control & Diagnosis for the Wiley Journal of Adaptive Control & Signal Processing. Ron chaired the International Programme Committees for IFAC Safeprocess'97, UKACC Control'98 and the 16th Mediterranean Control Conference, Med'08. He was chair of the IFAC Technical Committee on Safety & Supervision of Technical Processes [1996-2002] and served as vice-chair of the IFAC Policy Committee [2008-2011]. For the EC he was rapporteur in 1995 for the committee reporting on the need for European research on Control in Embedded Systems. Ron coordinated the EU research projects IQ2FD and DAMADICS and contributed to FP6 NeCST and FP7 ADDSAFE. He is the recipient of 14 EPSRC research grants, several awards from industry and received the IEE Kelvin Premiun in 1997 for a paper on a stochastic approach to robust unknown input de-coupling (with J Chen). His research interests are: Robust FDI/FDD and FTC for dynamic systems, multiple-model and de-centralized strategies for FDI/FDD & FTC, robust fault estimation, reconfigurable in aerospace systems, FTC for offshore wind turbines. He is Fellow of IEEE, senior member of AIAA and Fellow of the Institute of Measurement and Control.

*Refreshments will be served following the seminar
in the Foyer of the
Sir Henry Stephenson Building*