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Automatic  
Control and  
Systems  
Engineering

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

## **“Adaptive Model Predictive Control: Robustness, Performance Enhancement and Parameter Estimation”**

**Professor Mark Cannon**

*Associate Professor, Engineering Science Department  
University of Oxford, UK*

**Thursday, 30 May 2019 at 14:00**  
LT2, Sir Henry Stephenson Building

### **Abstract**

Control algorithms that combine online model identification with optimization of predicted performance have been a focus of research since the origins of Model Predictive Control (MPC) some 40 years ago. However few control strategies based on MPC with online model identification provide guarantees of robust performance and constraint satisfaction. Recent developments in robust predictive control, set-based identification and convex optimization have led to a resurgence of interest in this direction. This talk will outline recent work on computationally tractable robust adaptive MPC formulations for systems with additive disturbances subject to state and control constraints. The approach has the potential to overcome a fundamental limitation of robust MPC, namely that the amount of uncertainty in system models and unknown disturbances restricts the achievable performance, even though model uncertainty can often be reduced by making use of information acquired during the closed loop operation of the controller. We will explore conditions for parameter convergence and connections with the well-known dual control problem. The talk will also discuss how to balance conflicting requirements on control signals for achieving good tracking performance and improving parameter estimates through convex constraints that ensure persistency of excitation.

### **Biography**

Professor Mark Cannon received the degrees of MEng and DPhil from Oxford University in 1993 and 1998, and the SM degree from Massachusetts Institute of Technology in 1995. Since 2002 he has been a Lecturer (now Associate Professor) in the Engineering Science Department and a Fellow of St. John's College, University of Oxford.

Mark's research is concerned with the design of controllers for uncertain systems with the aim of optimizing performance subject to constraints. Constraints on system behaviour are present in almost all control problems because of physical, environmental and economic operating restrictions. Controllers that optimize the predicted future behaviour of a system can account for constraints explicitly, and this can provide significant improvements in performance and applicability. He is interested in the fundamental properties of constrained control strategies such as feasibility and closed-loop stability, together with computational issues such as convexity and efficiency of implementation for systems with fast dynamics and stochastic uncertainty. This research has applications in aerospace, power generation and process industries as well as sustainable development and economics.