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Department of Electrical and
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Title: *«Control and System Theory of Decentralized Control of Stochastic Systems - The Communication Problem of Controllers and Coordination Control»*

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Room XOD02 – 013, New Campus – University of Cyprus

Abstract:

The control theoretic problem of decentralized control is to synthesize two or more controllers having received different observations which together achieve control objectives of performance and of stability. Examples of control engineering and of communication engineering provide motivation for the research on decentralized control. Demosthenis Teneketzis and his students (U. Michigan, MI, USA) have substantially contributed to the theory of decentralized control partly based on the fundamental framework developed by H.S. Witsenhausen. However, the theory of decentralized control is far from complete. In this lecture the focus is on the interactions of the controllers via the control system, for which concepts and theory are needed. Research issues include: What information should a controller communicate to which other controllers via the control system? How is this communication best carried out? How should a controller use information received from other controllers to attain the control objectives? This then leads to a problem of information theory which is currently unsolved though recent progress is promising. Coordination control is an alternative to decentralized control. The coordination control approach is to control a network of systems by imposing a coordinator which directs all subsystems so as to achieve that part of the control objectives related to their interaction. The concept of conditional independence of linear systems is shown to lead to a decomposition of the overall linear system and to a control synthesis procedure. The performance of this controlled coordinated system is then evaluated.
An extension of this approach is control of multilevel systems. No prior knowledge of decentralized control is required and the lecture is not overly technical. The emphasis is on problems and on concepts. Most control problems of networked systems can be regarded according to the framework provided. The research is partly based on cooperation with Mr. Cesar Uribe.

Biography:

Jan H. van Schuppen studied at the Department of Applied Physics of the Delft University of Technology and graduated with an engineering diploma in 1970. He was awarded a Ph.D. diploma by the Department of Electrical Engineering and Computer Science of the University of California at Berkeley, California, USA in 1973. He is currently employed as Full Professor at the Department of Mathematics of the Delft University of Technology, Delft, The Netherlands. His research area is control and system theory, and more widely applied mathematics. Research areas outside mathematics in which he has experience in include: motorway traffic, communication systems, compartmental modeling, and biochemical reaction systems. His current research focus is on: control of distributed systems and networks, control of hybrid systems, control of discrete-event systems, realization and system identification, and modeling and control of biochemical reaction systems.