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School of Engineering
Department of Electrical and Computer Engineering

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Title: ***«Realization of rational systems»***

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Room KENTP. A019, Old Campus – University of Cyprus

Abstract:
Realization theory is the main topic of system theory. Before covering the case of rational systems the case of linear systems will be treated. The realization problem is to determine for a considered input-output relation: (1) whether there exists a dynamic system whose input-output relation equals the considered input-output relation; such a system is then called a realization of the considered relation; (2) to characterize those realizations which have a minimal state space, often in terms of controllability and observability; (3) to classify the set of all minimal realizations of the considered input-output relation. The realization problem of linear systems starts with a linear impulse response function of the system. A necessary and sufficient condition for the existence of a realization is provided. It uses the concept of a rank of a matrix. The classification is in terms of a set of state-space transformations. The problem was solved by R.E. Kalman (1963). The realization problem of rational systems starts with the input-output map. The existence is in terms of an algebra having a finite set of generators. The theory uses the concept of a transcedence degree of a polynomial algebra. The characterization of minimality is in terms of controllability and observability. The classification is in terms of a set of birational maps. Computational issues and extensions will be described. This lecture is the second of a series of lectures on rational systems. The first lecture was presented on 24 November 2014. It is not necessary that you have attended the first lecture to be able to listen to the second lecture though it helps. The research is joint work with Jana Nemcova (Inst. Chemical Technology, Prague, Czech Republic).

Biography:
Jan H. van Schuppen is since 1 October 2012 affiliated as researcher with the the company Van Schuppen Control Research in Amsterdam and as professor emeritus with the Department of Mathematics of the Delft University of Technology in Delft, The Netherlands. Formerly he was primarily affiliated with the research institute Centrum voor Wiskunde en Informatica (CWI) in Amsterdam, The Netherlands. Van Schuppen's research interests include control of distributed and of multilevel systems, control of discrete-event systems and of hybrid systems, stochastic control, realization, and system identification. In applied research his interests include engineering problems of control of motorway traffic, and control and system theory for the life sciences. He is Advisory-Editor of the journal Mathematics of Control, Signals, and Systems (MCSS), was Associate Editor-at-Large of the journal IEEE Transactions Automatic Control, and was Department Editor of the journal Discrete Event Dynamic Systems. He was and is the advisor of 18 Ph.D. students, 12 post-docs, and 9 master level students. Finally, he was also the coordinator of the EU-financed C4C Project (CON4COORD, Grant agreement INFSO-ICT-223844).