



IEEE Huntsville Section Control Systems Society



Speaker:	Professor Alexander B. Kurzhanski, Moscow State University & UC Berkeley
Subject:	The Mathematics of Measurement Feedback Control under Set-Membership Uncertainty
Date:	Thursday, April 16th, 2009
Time:	11:00am - 1:00pm
Place:	Marriott Hotel, Space & Rocket Center
Cost:	\$25 for plate lunch, service, room and gratuity
Reservations:	Seating is limited and reservations are required. Contact Wayne Kendrick at 876-5611 if you plan to attend or email to gwkendrick@mchsi.com. A confirmation will be returned within 24 hours of your reservation.



Introduction: Fellow control systems professionals and enthusiasts, we are presented with a rare opportunity to receive an old world perspective on modern control systems theory development. Professor Alexander Kurzhanski is here in the United States as a guest lecturer from the Moscow State University to the Univ. of California, Berkeley. As part of his stay, he is traveling here to Huntsville and has offered to provide us with a lecture on stochastic control theory. I hope you will join me in welcoming Prof. Kurzhanski to the Huntsville Section of the IEEE Control System Society Thursday, April 16th for a luncheon and to experience the benefits of his lecture. The cost of the luncheon is \$25 to cover the costs of the plate lunch, service, room and gratuity. Please pass the word to your colleagues who may be interested in participating.

Abstract and Biographical Sketch: See the attachment for the lecture description and a detailed synopsis of Professor Kurzhanski's distinguished career.

Directions: Take I-565 to the Wynn Dr. / Space and Rocket Center Exit. Turn South and then West toward the Space and Rocket Center. The Marriott is on the left. You can't miss it

Notes: You do not need to be an IEEE member to attend; we welcome all guests. Registration begins at 11:00 with service to begin at around 11:15. Again, you will need a reservation to participate in the luncheon. You may all ahead for possible non-lunching seating if available.

See you there!!!



**Please Mark Your Calendar &
Post at Your Business**





The Mathematics of Measurement Feedback Control under Set-membership Uncertainty

Professor Alexander B. Kurzhanski

Moscow State University and University of California at Berkeley

Abstract. The problem of measurement output control under uncertain disturbances (noise) is one of the central topics in the theory of control synthesis. It is well motivated by applied issues and has been thoroughly developed in a stochastic setting as a combination of stochastic filtering theory with the theory of stochastic control in itself. However a considerable number of problems in control design have to deal with systems subjected to information conditions which are other than stochastic. Here the uncertain items are treated as unknown, for which there is no available statistical description. The related approaches naturally require new types of techniques and new type of formalization of the control problems. Such problems were investigated mostly within the H_∞ setting, with soft-type integral costs, while problems with hard bounds on the unknowns were less developed. The present lecture describes the solution to the problem of output feedback control through available measurements under unknown but bounded disturbances subjected to *hard bounds* on the uncertain items and the controls. It covers topics from basic theoretical problems to computational methods. The solution scheme, which is applicable to nonlinear systems, with greater specifics for the linear case, lies in the combination of *dynamic programming, set-valued analysis and min-max approaches*. For systems with linear structure and convex constraints the computational procedure is based on *ellipsoidal calculus* which proved effective for many problems and allows complementally software. For the nonlinear case calculations may be facilitated by using the specifics of the problem, while applying modifications of the earlier suggested *comparison principles* which allow relaxing the original equations or variational inequalities of the Hamilton-Jacobi type through simpler relations.

Bio-sketch. Having graduated with honors in Electrical Engineering at the Technical University of Ural, Sverdlovsk, USSR (1962), Alexander Kurzhanski went through graduate studies in mathematics and mechanics at the University of Ural (1962-1965) with PhD Degree in 1965, habilitation “doctorate” in 1971, full professor in 1974. In 1967-1984 he was at the Institute of Mathematics and Mechanics, Ural Branch, Academy of Sciences of USSR as Senior Researcher, Head of Department and Director. He was Chairman of the Systems and Decision Sciences Program and Deputy Director at IIASA (the International Institute for Applied Systems Analysis), in Laxenburg, Austria, in 1984-1992. Since 1992 he is Head of Department of Systems Analysis at Moscow State University (MSU), College of Computational Mathematics and Cybernetics and also a Distinguished Professor of MSU since 1999. He was elected Associate Member of the Russian (former Soviet) Academy of Sciences in 1981 and Full Member in 1990. Dr. Kurzhanski is the Chairman of the Russian National Committee on Automatic Control (the IFAC NMO) and Member of the IFAC Council. Since 2001 he is a Guest Research Scholar with College of Engineering, University of Berkeley, CA, USA. His research interests and achievements are in the field of estimation and control under uncertainty and incomplete (realistic) information, feedback control of complex systems, inverse problems of mathematical physics, computational methods in dynamics and control and mathematical modeling for applied systems analysis.