

Preface



This special issue is dedicated to Professor Sanjoy K. Mitter, a world renowned researcher and highly respected scholar in areas that span across Systems, Communications, and Control.

Professor Mitter received his Ph.D. degree from the Imperial College of Science and Technology, University of London, in 1965. He taught at Case Western Reserve University from 1965-1969. He joined MIT in 1969 as a Visiting Professor. In 1970, he became an Associate Professor in the Department of Electrical Engineering and Computer Science, and he is currently a Professor of Electrical Engineering. He served as Director, then co-Director of the Laboratory

for Information and Decision Systems between 1991 and 1999. He is a Fellow of the IEEE and was the recipient of the IEEE Control Systems Field Award in 2000, “for contributions to optimization, optimal control, and nonlinear filtering, and for interdisciplinary research that has expanded the boundaries of control theory.” In 1988 he was elected to the National Academy of Engineering of USA.

Sanjoy has held many prestigious visiting positions. Over the years, he had visited the Tata Institute of Fundamental Research, Bombay, India; Scuola Normale Superiore, Pisa, Italy; Imperial College of Science and Technology; Institut National de Recherche en Informatique et en Automatique, France; University of Groningen, the Netherlands, and several universities in the United States. He has served on several advisory committees and editorial boards for IEEE, SIAM, AMS, NSF, and ARO. He is currently an Associate Editor of the Journal of Applied Mathematics and Optimization, SIAM Review, Ulam Quarterly, and Random and Computational Dynamics, and CIS. Sanjoy played an important role in unifying the fields of Systems, Communications, Control, and Signal processing. Notable examples of his fundamental work would include nonlinear filtering, stochastic control, the relation between mathematical physics and system theory, the function and organization of complex systems, and control under limited information capacity. While his main interests always remain focused on the theoretical foundations, he has also contributed greatly in many engineering applications. Some notable examples would be his work in the control of interconnected power systems and pattern recognition. Sanjoy has recently celebrated his 70th birthday. The editors of CIS are glad to take this opportunity to organize a dedicated issue. An invitation for submission was announced in 2003 and we have received strong responses from invited and contributed authors. After a careful review process, 11 papers have been accepted for publication and are published in two parts. The papers cover a wide range of areas, mostly related to his broad spectrum of research interest.

In the first part, we present five papers which all have some connections with communication networks. The first paper deals with the hot topic of a system of multiple mobile autonomous agents. It addresses the design issue for sensor network topologies in order to maintain a rigid formation for cooperative tasks. The second

paper studies a problem of performance estimation for a Markov chain conditioned on a rare event. A key application focus of the methodology is for communication networks. The third paper proposes using combinatorial double auctions as a mechanism for a bandwidth allocation problem in a communication network. The fourth and the fifth paper deal with performance analysis issues of ad-hoc networks. One paper provides a throughput and delay analysis of the ad-hoc operation mode in the IEEE 802.11 protocol for wireless local area networks. The other paper analyzes the transport capacity of a heterogeneous ad-hoc network with wired and wireless links.

In the second part, we present six papers covering topics in control, image processing, and information theory. Of the three papers related to control theory, the first paper proposes a novel methodology to handle the ill-posed problem of inverse kinematics of redundant robotic systems under constraints. The second paper considers the almost-practical stabilization of scalar, linear systems via quantized feedback through a symbolic dynamical framework. The general problem of control under quantization and communication constraints receives a lot of attention lately from many researchers, including Sanjoy himself. The third paper related to control theory addresses the classical Birkhoff interpolation problem and shows that there is a connection between the existence of a solution to this problem and the existence of a solution to an optimal control problem.

There are two papers dealing with image processing. The first paper addresses the image segmentation problem introduced by Mumford and Shah by introducing a family of sets well-suited for image segmentation. The second paper deals with the biophysical problem of determining the 3-D structure of a particle, such as a virus, from a set of linearly-filtered 2-D projections. The final paper in the second part deals with message-passing decoding, which has applications to Turbo-codes and Low-Density Parity-Check codes.

We would like to thank all the people who contributed to this special issue. Last but not the least, we would like thank our referees for their careful and critical reviews.

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