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Characteristic Functions, Scattering Functions and Transfer Functions

The Moshe Livsic Memorial Volume

Daniel Alpay
Victor Vinnikov
Editors

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Editorial Introduction

Daniel Alpay and Victor Vinnikov

During the period July 9 to July 13, 2007, a conference called **Characteristic functions and transfer functions in operator theory and system theory: a conference dedicated to Paul Fuhrmann on his 70th anniversary and to the memory of Moshe Livsic on his 90th anniversary** was held at the Department of Mathematics of Ben-Gurion University of the Negev. The notions of transfer function and characteristic functions proved to be fundamental in the last fifty years in operator theory and in system theory. This conference was envisaged to pay tribute to our colleagues Paul Fuhrmann and Moshe Livsic who played a central role in developing these notions. Sadly, Moshe Livsic passed away on the 30th of March, 2007 (11th of Nissan 5767), so the conference was dedicated to his memory. It is a pleasure to thank all the participants, who contributed to a very exciting and fruitful conference, and especially those who submitted papers to the present volume.

The volume contains a selection of thirteen research papers dedicated to the memory of Moshe Livsic. The topics addressed can be divided into the following categories:

Classical operator theory and its applications: This pertains to the paper *Differential-difference equations in entire functions* by G. Belitskii and V. Tkachenko, the paper *Bi-Isometries and Commutant Lifting* by H. Bercovici, R.G. Douglas. and C. Foias and the paper *Convexity of ranges and connectedness of level sets of quadratic forms* by I. Feldman, N. Krupnik and A. Markus.

Ergodic theory and stochastic processes: We have the papers *The one-sided ergodic Hilbert transform of normal contractions* by G. Cohen and M. Lin, and *Integral Equations in the Theory of Levy Processes* by L. Sakhnovich.

Geometry of smooth mappings: This is covered by the paper of Y. Yomdin entitled *β -Spread of sets in metric spaces and critical values of smooth functions*.

Mathematical physics: This topic is covered by the paper *Solvable models for quantum networks and a modified analytic perturbation procedure* by B. Pavlov.

Schur analysis: This is covered by the paper of H. Dym and D. Volok *Pick Matrices for Schur Multipliers* and the papers *The Schur Algorithm in Terms of System*

Realizations by B. Fritzsche, V. Katsnelson and B. Kirstein and *On some interrelations between J -Potapov functions and J -Potapov sequences* by B. Fritzsche, B. Kirstein and U. Raabe.

System theory: This topic is covered by the papers *Inverse Stieltjes like functions and inverse problems for systems with Schrödinger operator* by S. Belyi and E. Tsekanovskii, the paper *Model reduction in symbolically semiseparable systems with application to building preconditioners for 3D sparse systems of equations* by P. Dewilde, H. Jiao and S. Chandrasekaran, and *The Stable rank of a Nest Algebra and Strong Stabilization of Linear Time-Varying Systems* by A. Feintuch.

The variety of topics attests well to the breadth of Moshe Livsic's mathematical vision and the deep impact of his work. Another volume, entitled **Selected translations of papers of Moshe Livsic**, is planned in the same book series, with editors Victor Katsnelson, Israel Gohberg and the present editors. The volume will also contain memorial material about Moshe.

The conference in July 2007 was supported by the following sources: The Center for Advanced Studies in Mathematics of Ben-Gurion University of the Negev (which has also supported three previous workshops on operator and system theory in 2001, 2003, and 2005), the President of Ben-Gurion University of the Negev, the Rector of Ben-Gurion University of the Negev, the Dean of the Faculty of Natural Sciences of Ben-Gurion University of the Negev, and the Earl Katz Family Chair in Algebraic System Theory. The visit and participation Prof. J. Ball was supported by the US-Israel Binational Science Foundation. The participation of Prof. H. Woerdeman was supported by the Visiting Fellowship Program at the Faculty of Natural Sciences of Ben-Gurion University of the Negev.

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