CONTEMPORARY MATHEMATICS

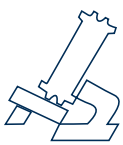
568

Israel Mathematical Conference Proceedings

Optimization Theory and Related Topics

A Workshop in Memory of Dan Butnariu
January 11–14, 2010
Haifa, Israel

Simeon Reich
Alexander J. Zaslavski
Editors



American Mathematical Society
Providence, Rhode Island

Bar-Ilan University
Ramat-Gan, Israel

Optimization Theory and Related Topics

CONTEMPORARY MATHEMATICS

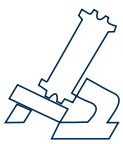
568

Israel Mathematical Conference Proceedings

Optimization Theory and Related Topics

A Workshop in Memory of Dan Butnariu
January 11–14, 2010
Haifa, Israel

Simeon Reich
Alexander J. Zaslavski
Editors



American Mathematical Society
Providence, Rhode Island

Bar-Ilan University
Ramat-Gan, Israel

2010 *Mathematics Subject Classification.* Primary 34-XX, 39-XX, 46-XX, 47-XX, 49-XX, 52-XX, 65-XX, 90-XX, 91-XX, 93-XX.

Library of Congress Cataloging-in-Publication Data

Optimization theory and related topics : Israel mathematical conference proceedings, a workshop in memory of Dan Butnariu, January 11–14, 2010, Haifa, Israel / Simeon Reich, Alexander J. Zaslavski, editors.

p. cm. — (Contemporary mathematics ; v. 568)

ISBN 978-0-8218-6908-6 (alk. paper)

1. Mathematical optimization — Congresses. 2. Differential equations — Congresses. I. Butnariu, Dan. II. Reich, Simeon. III. Zaslavski, Alexander J.

QA402.5.O6745 2012
519.6—dc23 2011051454

Contents

Preface

A special workshop on Optimization Theory and Related Topics, in memory of the late Professor Dan Butnariu, took place in Haifa, Israel, on January 11-14, 2010. This workshop was organized and sponsored by the Center for Mathematical Sciences (CMS) at the Technion, with additional support from the University of Haifa and from the Center for Computational Mathematics and Scientific Computation (CCMSC) at the University of Haifa, and took place in both institutions. The organizing committee was comprised of Yair Censor (University of Haifa), Simeon Reich (Technion) and Alexander Zaslavski (Technion). The workshop brought together a selected group of about forty experts from all over the world: Australia, Brazil, China, Europe, Israel, Russia and the USA.

This volume is the tangible record of this workshop. Most of the papers assembled here have been contributed by participants in the workshop. In some cases, they have chosen to submit manuscripts which depart from the texts of their lectures. Several invited speakers who were unable to attend the workshop also contributed papers to these proceedings. All submissions have been carefully refereed and revised whenever necessary.

The papers collected in this volume cover many different areas of Optimization Theory and its applications: maximal monotone operators, sensitivity estimates via Lyapunov functions, inverse Newton transforms, infinite-horizon Pontryagin principles, singular optimal control problems with state delays, descent methods for mixed variational inequalities, games on MV-algebras, ergodic convergence in subgradient optimization, applications to economics and technology planning, the exact penalty property in constrained optimization, nonsmooth inverse problems, Bregman distances, retraction methods in Banach spaces, and iterative methods for solving equilibrium problems.

The Editors

Biography and Bibliography of Dan Butnariu

Dan Butnariu was born in Hirlau, Romania, on February 1, 1951. He studied at the Al. I. Cuza University in Iasi, Romania, where he received his Ph.D. in 1980 under the supervision of Irinel Dragan, and continued to teach there until 1983. He immigrated to Israel in 1984 and was a post-doctoral fellow at the Weizmann Institute of Science until 1986, when he moved to the University of Haifa. Dan was chairman of the Department of Mathematics from 1997 to 1999, and held visiting positions in Linz, at the University of Texas, in Rio de Janeiro, and at CUNY. An active researcher in various fields of applied mathematics, he published over 80 papers in approximation theory, convexity, operator theory, game theory, fuzzy topology, and mathematical economics. Dan had a number of graduate students, and served on the editorial board of several journals. He was a member of the AMS since 1985. Dan Butnariu passed away on July 4, 2008, and is survived by his wife, daughter, grandson, and mother.

1. Butnariu, D.: *L-fuzzy topologies*, Bull. Math. Soc. Sci. Math. R. S. Roumanie (N.S.) **19** (1975), 227–236.
2. Butnariu, D.: *L-fuzzy games and their minimax theorem* (Romanian), Stud. Cerc. Matem. **28** (1976), 141–160.
3. Butnariu, D.: *(L,L′)-fuzzy topological spaces*, An. Sti. Univ. "Al. I. Cuza" Iaşi Secţ. I a Mat. (N.S.) **23** (1977), 9–16.
4. Butnariu, D.: *L-fuzzy automata – a neural model*, in: "Modern Trends in Cybernetics and Systems", vol. 2, J. Rose and C. Bilciu (eds.), Springer Verlag, Berlin-Heidelberg-New York, 1977, pp. 119–125.
5. Butnariu, D.: *Three persons fuzzy games* (Romanian), Stud. Cerc. Matem. **29** (1978), 99–102.
6. Butnariu, D.: *Fuzzy games: A description of the concept*, Fuzzy Sets and Systems **1** (1978), 181–192.
7. Butnariu, D.: *Equilibrium points for two-persons fuzzy games*, Stud. Cerc. Matem. **30** (1978), 123–133.
8. Butnariu, D.: *An existence theorem for possible solutions of a two-persons fuzzy game*, Bull. Math. Soc. Sci. Math. R. S. Roumanie (N.S.) **23** (71) (1979), 29–35.
9. Butnariu, D.: *Solution concepts for N-persons fuzzy games*, in: "Advances in Fuzzy Set Theory and Applications", M.M. Gupta, R Ragade and R. Yager (eds.), North-Holland, Amsterdam, 1979, pp. 339–359.
10. Butnariu, D.: *Two-dimensional concepts Of nucleolus and kernel*, in: "Proc. of the Third Nat. Conf. of Oper. Res.", I. Marusciac and W. Brechner (eds.), Babes-Bolyai University Press, Cluj-Napoca, 1979, pp. 30–34.

11. Butnariu, D.: *The C-nucleolus of a N-persons game*, in: "Papers Delivered at the Jubiliar Scientific Session of the Polytechnic Institute of Iasi", I.P.I. Iasi, 1979, pp. 98–104. (Abstract in Notices Amer. Math. Soc., August, 1979).
12. Butnariu, D.: *A fixed point theorem and its application to fuzzy games*, Rev. Roumaine Math. Pures Appl. **24** (1979), 1425–1432.
13. Butnariu, D.: *Stability and Shapley value for N-persons fuzzy games*, Fuzzy Sets and Systems **4** (1980), 63–72.
14. Butnariu, D.: *Models of fuzzy games I* (Romanian), Stud. Cerc. Mat. **32** (1980), 45–54.
15. Butnariu, D.: *Models of fuzzy games II* (Romanian), Stud. Cerc. Mat. **32** (1980), 55–63.
16. Butnariu, D.: *Models of fuzzy games III* (Romanian), Stud. Cerc. Mat. **32** (1980), 153–166.
17. Butnariu, D.: *The continuity of the additive fuzzy-set functions*, in: "Papers Presented at the Nat. Conf. of General Topology", University of Iasi, 1981, pp. 8–10.
18. Butnariu, D.: *Fixed points for fuzzy mappings*, Fuzzy Sets and Systems **7** (1982), 191–207.
19. Butnariu, D.: *Additive fuzzy measures and integrals I*, J. Math. Anal. Appl. **93** (1983), 436–452.
20. Butnariu, D.: *Decompositions and range of additive fuzzy measures*, Fuzzy Sets and Systems **10** (1983), 135–155.
21. Butnariu, D.: *Computing fixed points for fuzzy mappings*, in: "Trans. of the Ninth Prague Conf. on Information Theory, Statistical Decision Functions, Random Processes", M. Mares (ed.), Reidel, Dordrecht, 1983, pp. 165–170.
22. Butnariu, D.: *Non-atomic fuzzy measures and games*, Fuzzy Sets and Systems **17** (1985), 39–52.
23. Butnariu, D.: *Fuzzy measurability and integrability*, J. Math. Anal. Appl. **117** (1986), 385–410 (Additive Fuzzy Measures and Integrals II).
24. Butnariu, D.: *On some recent results on fuzzy games: An informal research summary*, Fuzzy Sets and Systems (Bulletin) **19** (1986), 182–185.
25. Butnariu, D.: *A note on the measurability of fuzzy mappings*, in: "Developments of the Theory of Fuzzy Sets", W. Bandler and A. Kandel (eds.), New Orleans University Press, 1986, pp. 48–55.
26. Butnariu, D.: *Values and cores of fuzzy games with infinitely many players*, Internat. J. Game Theory **16** (1987), 43–68.
27. Butnariu, D.: *Additive fuzzy measures and integrals III*, J. Math. Anal. Appl. **125** (1987), 288–303.
28. Butnariu, D.: *Autonomous evolutive systems with ambiguous states*, in: "Knowledge-Based Systems in Decision and Control", M. M. Gupta and T. Yamakawa (eds.), Elsevier Science Publishers, North-Holland, Amsterdam, New York, Tokyo, 1988, pp. 229–246.
29. Butnariu, D.: *Measurability concepts for fuzzy mappings*, Fuzzy Sets and Systems **31** (1989), 77–82.
30. Butnariu, D.: *A fuzzy game theoretical approach of the rate problem for services in bulk*, in: "Interface Between Artificial Intelligence and

Operation Research", J. Verdegay and L. Delgado (eds.), Verlag TTV-Rheinland, Köln, 1989, pp. 35–51.
31. Butnariu, D. and Censor, Y.: *On the behavior of a block-iterative method for solving convex feasibility problems*, Int. J. Comput. Math. **34** (1990), 79–94.
32. Butnariu, D. and Roventa, E.: *On a class of neural automata*, in: "Proceedings of the 3-rd NAFIPS Conference", vol. 2, I. B. Turksen (ed.), University of Toronto, 1990, pp. 307–311.
33. Butnariu, D. and Censor, Y.: *A method of approximating the solution set of a system of convex inequalities by polytopes*, J. Comput. Appl. Math. **36** (1991), 289–304.
34. Butnariu, D. and Klement, E. P.: *Triangular norm based measures and their Markov kernel representation*, J. Math. Anal. Appl. **162** (1991), 111–143.
35. Butnariu, D.: *A note on the weighted Shapley value*, Libertas Math. **11** (1991), 1–7.
36. Butnariu, D. and Klement, E. P.: *Triangular norm based measures and some applications to measure and game theory*, Fuzzy Systems and Artificial Intelligence, (Bechyne, 1990), 5–23. Reprinted in: "Fuzzy Approach to Reasoning and Decision Making", V. Novak, J. Ramik, M. Cerny and J. Nekola, (eds.), Kluwer Academic Publishers, Dordrecht, 1992, pp. 89–105.
37. Butnariu, D. and Mehrez, A.: *On a class of generalized gradient methods for solving locally Lipschitz feasibility problems*, in: "System Modelling and Optimization", P. Kall (ed.), Proc. 15-th IFIP Conference, Zurich, Switzerland, 1991, Lecture Notes in Control and Inform. Sci., vol. 180, Springer Verlag, 1992, pp. 282–291.
38. Butnariu, D. and Roventa, E.: *A measure theoretical approach of the problem of computing production costs*, Fuzzy Sets and Systems **48** (1992), 305–321.
39. Butnariu, D. and Mehrez, A.: *Convergence criteria for generalized gradient methods of solving locally Lipschitz feasibility problems*, Comput. Optim. Appl. **1** (1992), 307–326.
40. Butnariu, D. and Censor, Y.: *Strong convergence of almost simultaneous block-iterative projection methods in Hilbert spaces*, J. Comput. Appl. Math. **53** (1994), 33–42.
41. Butnariu, D., Klement, E. P. and Zafrani, S.: *On triangular-norm based propositional fuzzy logics*, Fuzzy Sets and Systems **69** (1995), 241–255.
42. Butnariu, D. and Flam, S. D.: *Strong convergence of expected-projection methods in Hilbert spaces*, Numer. Funct. Anal. Optim. **16** (1995), 601–636.
43. Butnariu, D.: *The expected-projection method: its behavior and applications to linear operator equations and convex optimization*, J. Appl. Anal. **1** (1995), 95–108.
44. Butnariu, D. and Klement, E. P.: *Core, value and equilibria for market games: on a problem of Aumann and Shapley*, Internat. J. Game Theory **25** (1996), 149–160.

45. Butnariu, D., Censor, Y. and Reich, S.: *Iterative averaging of entropic projections for solving stochastic convex feasibility problems*, Comput. Optim. Appl. **8** (1997), 21–39.
46. Alber, Y. and Butnariu, D.: *Convergence of Bregman-projection methods for solving convex feasibility problems in reflexive Banach spaces*, J. Optim. Theory Appl. **92** (1997), 33–61.
47. Butnariu, D. and Iusem, A. N.: *Local moduli of convexity and their application to finding almost common fixed points of measurable families of operators*, in: "Recent Developments in Optimization Theory and Nonlinear Analysis", Y. Censor and S. Reich (eds.), Contemp. Math. **204**, Amer. Math. Soc., Providence, RI, (1997), 61–91.
48. Butnariu, D.: *Methods of solving optimization problems in the space of fuzzy vectors*, Libertas Math. **XVII** (1997), 1–7.
49. Butnariu, D. and Iusem, A. N.: *On a proximal point method for convex optimization in Banach spaces*, Numer. Funct. Anal. Optim. **18** (1997), 723–744.
50. Butnariu, D., Iusem, A. N. and Isnard, C.: *A mixed Hölder and Minkowski inequality*, Proc. Amer. Math. Soc. **127** (1999), 2405–2415.
51. Butnariu, D., Reich, S. and Zaslavski, A. J.: *Generic power convergence of operators in Banach spaces*, Numer. Funct. Anal. Optim. **20** (1999), 629–650.
52. Butnariu, D., Iusem, A. N. and Burachik, R.: *Iterative methods for solving stochastic convex feasibility problems and applications*, Comput. Optim. Appl. **15** (2000), 269–307.
53. Butnariu, D. and Klement, E. P.: *Measures on triangular-norm based tribes: Properties and integral representation*, in: "Fuzzy Measures and Integrals", M. Grabisch, T. Murofushi and M. Sugeno (eds.), Physica-Verlag, Heidelberg, 2000, pp. 233–246.
54. Butnariu, D., Iusem, A. N. and Resmerita, E.: *Total convexity of the powers of the norm in uniformly convex Banach spaces*, J. Convex Anal. **7** (2000), 319–334.
55. Alber, Y., Butnariu, D. and Ryzantseva, I.: *Regularization methods for ill-posed inclusions and variational inequalities with domain perturbations*, J. Nonlinear Convex Anal. **2** (2001), 53–79.
56. Butnariu, D. and Resmerita, E.: *The outer Bregman projection method for solving stochastic convex feasibility problems in Banach spaces*, in: "Inherently Parallel Algorithm in Feasibility and Optimization and their Applications", D. Butnariu, Y. Censor and S. Reich (eds.), Elsevier, Amsterdam, 2001, pp. 69–86.
57. Butnariu, D., Reich, S. and Zaslavski, A. J.: *Asymptotic behavior of quasi-nonexpansive mappings*, in: "Inherently Parallel Algorithms in Feasibility and Optimization and their Applications", D. Butnariu, Y. Censor and S. Reich (eds.), Elsevier, Amsterdam, 2001, pp. 49–68.
58. Butnariu, D., Reich, S. and Zaslavski, A. J.: *Asymptotic behavior of relatively nonexpansive mappings*, J. Applied Analysis **7** (2001), 151–174.
59. Butnariu, D. and Klement, E. P.: *Triangular norm based measures*, in: "Handbook of Measure Theory", E. Pap (ed.), Elsevier, Amsterdam, 2002, p. 51.

60. Butnariu, D., Reich, S. and Zaslavski, A. J.: *Generic power convergence of nonlinear operators in Banach spaces*, Proceedings of the 7-th International Conference of Nonlinear Functional Analysis and Applications, South Korea, August 2001, pp. 35–56.
61. Butnariu, D., Byrne, C. and Censor, Y.: *Redundant axioms in the definition of Bregman functions*, J. Convex Anal. **10** (2003), 245–254.
62. Butnariu, D., Iusem, A. N. and Zalinescu, C.: *On uniform convexity, total convexity and the convergence of the outer Bregman projection and proximal point algorithms in Banach spaces*, J. Convex Anal. **10** (2003), 35–61.
63. Butnariu, D. and Resmerita, E.: *Averaged subgradient methods for optimization and Nash equilibria computation*, Optimization **51** (2002), 863–888.
64. Butnariu, D. and Markowicz, I.: *Convergence of a Cimmino type method for computing almost common fixed points of totally nonexpansive families of operators*, Semin. Fixed Point Theory **3** (2002), 149–156.
65. Butnariu, D.: *Questions whose answers we do not know*, in: "Fixed Point Theory: 1950-2000", I.A. Rus, A. Petrusel and G. Petrusel (eds.), House of the Book of Science, Cluj-Napoca, 2002, pp. 124–128.
66. Alber, Y., Butnariu, D. and Kassay, G.: *Convergence and stability of a regularization method for maximal monotone inclusions and its applications to optimization*, in: "Variational Analysis and Applications", F. Giannessi and A. Maugeri (eds.), Springer, 2005, pp. 89–132.
67. Butnariu, D., Reich, S. and Zaslavski, A. J.: *Weak convergence of orbits of nonlinear operators in reflexive Banach spaces*, Numer. Funct. Anal. Optim. **24** (2003), 489–508.
68. Alber, Y., Butnariu, D. and Ryzantseva, I.: *Regularization of monotone variational inequalities with Mosco approximations of the constraint sets*, Set-Valued Analysis **13** (2005), 265–290.
69. Butnariu, D., Klement, E. P., Meisar, R. and Navara, M.: *Sufficient triangular norms in many-valued logics with standard negation*, Arch. Math. Logic **44** (2005), 829–849; electronic version: DOI 10.1007/s00153-004-0267-6.
70. Alber, Y., Butnariu, D. and Ryzantseva, I.: *Regularization and resolution of monotone variational inequalities with operators given by hypomonotone approximations*, J. Nonlinear Convex Anal. **6** (2005), 23–53.
71. Butnariu, D., Reich, S. and Zaslavski, A. J.: *There are many totally convex functions*, J. Convex Anal. **13** (2006), 623–632.
72. Butnariu, D., Reich, S. and Zaslavski, A. J.: *Asymptotic behavior of inexact orbits for a class of operators in complete metric spaces*, J. Appl. Anal. **13** (2007), 1–11.
73. Butnariu, D., Reich, S. and Zaslavski, A. J.: *Convergence to fixed points of inexact orbits for Bregman-monotone operators and for nonexpansive operators in Banach spaces*, in: "Fixed Point Theory and its Applications", H. Fetter Natansky et al. (eds.), Yokohama Publishers, 2006, pp. 11–32.
74. Butnariu, D. and Resmerita, E.: *Mosco stability of proximal mappings in reflexive Banach spaces*, J. Nonlinear Convex Anal. **8** (2007), 1–10.

75. Butnariu, D. and Kroupa, T.: *Shapley mappings and the cumulative value for n-person games with fuzzy coalitions*, European J. Oper. Res. **186** (2008), 288–299.
76. Butnariu, D., Davidi, R., Herman, G. T. and Kazantsev, I. G.: *Stable convergence behavior under summable perturbations of a class of projection methods for convex feasibility and optimization problems*, IEEE J. Selected Topics in Signal Processing **1** (2007), 540–547.
77. Butnariu, D., Reich, S. and Zaslavski, A. J.: *Stable convergence theorems for infinite products and powers of nonexpansive mappings*, Numer. Funct. Anal. Optim. **29** (2008), 304–323.
78. Butnariu, D. and Shklyar, B. Z.: *Existence and approximation of solutions for Fredholm equations of the first kind with applications to a linear moment problem*, Optim. Methods Softw. **23** (2008), 21–37.
79. Butnariu, D., Censor, Y., Gurfil, P. and Hadar, E.: *On the behavior of subgradient projections methods for convex feasibility problems in Euclidean spaces*, SIAM J. Optim. **19** (2008), 786–807.
80. Butnariu, D. and Kassay, G.: *A proximal-projection method for finding zeros of set-valued operators*, SIAM J. Control Optim. **47** (2008), 2096–2136.
81. Butnariu, D. and Kroupa, T.: *Enlarged cores and bargaining schemes in games with fuzzy coalitions*, Fuzzy Sets and Systems **160** (2009), 635–643.
82. Butnariu, D., Resmerita, E. and Sabach, S.: *A Mosco stability theorem for the generalized proximal mapping*, in: "Nonlinear Analysis and Optimization: I. Nonlinear Analysis", Contemp. Math. **513**, Amer. Math. Soc., Providence, RI (2010), 99–110.
83. Butnariu, D., Reich, S. and Sabach, S.: *A strong convergence theorem for resolvents of monotone operators*, J. Convex Anal. **17** (2010), 991–1006.

Conference Program

January 11-14, 2010

Monday, 11 January

09:00-09:30 Opening and greetings

09:30-10:10 Gabor Kassay
On proximal projection methods for finding zeros of set-valued operators

10:15-10:55 Zvi Artstein
Sensitivity of fixed-points of contraction-like maps

12:00-12:50 Gabor Herman
Efficient controls for finitely convergent sequential algorithms

12:05-12:45 Constantin Zalinescu
Vector variational principles for set-valued functions

14:15-14:55 Elena Resmerita
A dual norm iterative method for image restoration

15:00-15:45 Rainer Tichatschke
Elliptic regularization in context with proximal point methods

16:10-16:50 Yakov Alber
Generalized projections and stability of approximations in nonlinear problems

Tuesday, 12 January

09:00-09:40 Aharon Ben-Tal
Some remedies for some intractable optimization problems

09:45-10:25 Marc Teboulle
A moving balls approximation method for smooth constrained minimization

10:50-11:30 Regina Burachik
A deflected subgradient method for nonconvex optimization problems

11:35-12:15 Andrzej Cegielski
Cutters, their properties and applications to fixed-point problems

14:00-14:40 Sjur Flaam
On bilateral exchange

14:45-15:25 Ming Jiang
Iterative superiorization for image reconstruction

Session 1

15:50-16:30 Alexander Ioffe
Principle of Lagrange, normality and critical values of optimization problems

16:35-17:15 Valery Glizer
Asymptotic solution of an optimal control problem with partially cheap control for linear time delay systems

Session 2

15:50-16:30 Aviv Gibali
Two extensions of Korpelevich's extragradient method for solving the variational inequality problem in Euclidean space

16:35-17:15 Shoham Sabach
A strong convergence theorem for resolvents of monotone operators

Wednesday, 13 January

09:00-09:40 Vladimir Demyanov
Constructive tools of nonsmooth analysis

09:45-10:25 Diethard Pallaschke
Pairs of compact convex sets

10:50-11:30 Alfredo Iusem
On the maximal monotonicity of diagonal subdifferential operators

11:35-12:15 Yalcin Kaya
Runge-Kutta discretization and inexact restoration method for optimal control problems

14:00-14:40 Adi Ben-Israel
A generalized Weiszfeld method for the multi-facility location problem

14:45-15:25 Amir Beck
A fast proximal gradient method for solving a class of nonsmooth problems

15:50-16:30 Yakar Kannai
Strategic behavior in financial markets

Thursday, 14 January

09:00-09:40 Boris Mordukhovich
Variational analysis in semi-infinite and infinite programming

09:45-10:25 Tommy Elfving
Aspects on iterations in CT and related applications

10:50-11:30 Isao Yamada
Fixed-point approximations of certain quasi-nonexpansive mappings and their signal processing applications

Session 1

14:45-15:25 Ilya Ioslovich
On robust production and technology planning: preprocessing and model reduction

15:55-16:35 Tomas Kroupa
Coalition games and MV-algebras

16:40-17:20 Alex Zaslavski
Existence of approximate exact penalty in constrained optimization

Session 2

11:35-12:15 Evgeniy Pustylnik
New possibilities regarding the alternating projections method

14:00-14:40 Ran Davidi
Accelerated perturbation-resilient block-iterative projection methods with application to image reconstruction

14:45-15:25 Wei Chen
A fast linear optimizer applied to multi-criteria intensity modulated proton therapy planning

15:55-16:35 Daniel Reem
The Bregman distance without the Bregman function

16:40-17:20 Sedi Bartz
Minimal antiderivatives and monotonicity

List of Participants

Yakov Alber
Boston, MA, USA

Zvi Artstein
The Weizmann Institute of Science, Israel

Sedi Bartz
The Technion – Israel Institute of Technology, Israel

Amir Beck
The Technion – Israel Institute of Technology, Israel

Adi Ben-Israel
Rutgers University, USA

Aharon Ben-Tal
The Technion – Israel Institute of Technology, Israel

Regina S. Burachik
University of South Australia, Australia

Andrzej Cegielski
University of Zielona Góra, Poland

Yair Censor
University of Haifa, Israel

Wei Chen
The Graduate Center of the City University of New York, USA

Ran Davidi
The Graduate Center of the City University of New York, USA

Vladimir F. Demyanov
St. Petersburg State University, Russia

Tommy Elfving
Linköping University, Sweden

Sjur Didrik Flåm
Bergen University, Norway

Aviv Gibali
The Technion – Israel Institute of Technology, Israel

Valery Y. Glizer
ORT Braude College, Israel

Gabor T. Herman
The Graduate Center of the City University of New York, USA

Alexander D. Ioffe
The Technion – Israel Institute of Technology, Israel

Ilya Ioslovich
The Technion – Israel Institute of Technology, Israel

Alfredo N. Iusem
Instituto de Matemática Pura e Aplicada (IMPA), Rio de Janeiro, Brazil

Ming Jiang
Peking University, Beijing, China

Yakar Kannai
Weizmann Institute of Science, Rehovot, Israel

Gábor Kassay
Babeş-Bolyai University, Cluj, Romania

Yalçin Kaya
University of South Australia, Australia

Tomáš Kroupa
Institute of Information Theory and Automation of the ASCR, Prague, Czech Republic

Elena Litsyn
Ben-Gurion University of the Negev,
Israel

Boris Mordukhovich
Wayne State University, USA

Diethard Pallaschke
Institute of Operations Research,
University of Karlsruhe, Germany

Evgeniy Pustylnik
The Technion - Israel Institute of
Technology, Israel

Daniel Reem
The Technion – Israel Institute of
Technology, Israel

Simeon Reich
The Technion – Israel Institute of
Technology, Israel

Elena Resmerita
Johannes Kepler University, Linz,
Austria

Shoham Sabach
The Technion – Israel Institute of
Technology, Israel

Marc Teboulle
Tel Aviv University, Israel

Rainer Tichatschke
University of Trier, Germany

Isao Yamada
Tokyo Institute of Technology, Japan

Constantin Zălinescu
Al. I. Cuza University, Iaşi, Romania

Alexander Zaslavski
The Technion – Israel Institute of
Technology

Titles in This Subseries

Israel Mathematical Conference Proceedings (IMCP) is a publication, part of the Contemporary Mathematics Series, devoted to the proceedings of conferences, symposia and seminars. Collections of papers focusing on a certain subject will also be published. Prospective volumes may be submitted to any member of the editorial board. Each volume has an editor (or editors) responsible for its preparation. In order to ensure inexpensive and timely distribution, authors are requested to submit to the Editor of the volume an electronic TEX file of their manuscript in $\mathcal{AMS}$-LATEX, using the Contemporary Mathematics style file which can be downloaded at `http://www.ams.org/tex/author-info.html`. For further information, contact the Managing Editor, IMCP, Department of Mathematics, Bar-Ilan University, Ramat-Gan 52900, Israel; e-mail: `rowen@macs.biu.ac.il`.

568 **Simeon Reich and Alexander J. Zaslavski, Editors,** Optimization Theory and Related Topics, 2012

554 **Mark Agranovsky, Matania Ben-Artzi, Greg Galloway, Lavi Karp, Simeon Reich, David Shoikhet, Gilbert Weinstein, and Lawrence Zalcman, Editors,** Complex Analysis and Dynamical Systems IV, 2011

553 **Mark Agranovsky, Matania Ben-Artzi, Greg Galloway, Lavi Karp, Simeon Reich, David Shoikhet, Gilbert Weinstein, and Lawrence Zalcman, Editors,** Complex Analysis and Dynamical Systems IV, 2011

514 **Arie Leizarowitz, Boris S. Mordukhovich, Itai Shafrir, and Alexander J. Zaslavski, Editors,** Nonlinear Analysis and Optimization II, 2010

513 **Arie Leizarowitz, Boris S. Mordukhovich, Itai Shafrir, and Alexander J. Zaslavski, Editors,** Nonlinear Analysis and Optimization I, 2010

489 **David Ginzburg, Erez Lapid, and David Soudry, Editors,** Automorphic Forms and L-functions II, 2009

488 **David Ginzburg, Erez Lapid, and David Soudry, Editors,** Automorphic Forms and L-functions I, 2009

455 **Mark Agranovsky, Daoud Bshouty, Lavi Karp, Simeon Reich, David Shoikhet, and Lawrence Zalcman, Editors,** Complex Analysis and Dynamical Systems III, 2008

433 **Pavel Etingof, Shlomo Gelaki, and Steven Shnider, Editors,** Quantum Groups, 2007

404 **Alexander Borichev, Håkan Hedenmalm, and Kehe Zhu, Editors,** Bergman Spaces and Related Topics in Complex Analysis, 2006

402 **Zvi Arad, Mariagrazia Bianchi, Wolfgang Herfort, Patrizia Longobardi, Mercede Maj, and Carlo Scoppola, Editors,** Ischia Group Theory 2004, 2006

387 **Michael Entov, Yehuda Pinchover, and Michah Sageev, Editors,** Geometry, Spectral Theory, Groups, and Dynamics, 2005

382 **Mark Agranovsky, Lavi Karp, and David Shoikhet, Editors,** Complex Analysis and Dynamical Systems II, 2005

364 **Mark Agranovsky, Lavi Karp, David Shoikhet, and Lawrence Zalcman, Editors,** Complex Analysis and Dynamical Systems, 2004

CONM 568

Optimization Theory and Related Topics • Reich and Zaslavski, Editors

This volume contains the proceedings of the workshop on Optimization Theory and Related Topics, held in memory of Dan Butnariu, on January 11–14, 2010, in Haifa, Israel. An active researcher in various fields of applied mathematics, Professor Butnariu published over 80 papers. His extensive bibliography is included in this volume.

The articles in this volume cover many different areas of Optimization Theory and its applications: maximal monotone operators, sensitivity estimates via Lyapunov functions, inverse Newton transforms, infinite-horizon Pontryagin principles, singular optimal control problems with state delays, descent methods for mixed variational inequalities, games on MV-algebras, ergodic convergence in subgradient optimization, applications to economics and technology planning, the exact penalty property in constrained optimization, nonsmooth inverse problems, Bregman distances, retraction methods in Banach spaces, and iterative methods for solving equilibrium problems.

This volume will be of interest to both graduate students and research mathematicians.

ISBN 978-0-8218-6908-6

9 780821 869086

CONM/568

AMS/BIU