

PREFACE TO ASEN L. DONTCHEV MEMORIAL SPECIAL ISSUE



Asen Lyubomirov Dontchev is a world-renowned mathematician who has worked in the fields of variational analysis, optimization and optimal control. He passed away at the age of 73 in Ann Arbor, MI, USA, on September 16, 2021.

Asen Dontchev was born on June 19, 1948 in the city of Pleven, Bulgaria. After finishing high school, he continued his education at the Warsaw University of Technology, and completed there his PhD in Control Sciences in 1974. After returning to Bulgaria, Asen started his research career at the Institute of Mathematics and Informatics of the Bulgarian Academy of Sciences (BAS), where he became full professor in 1987. During the years of his employment at BAS, he focused on sensitivity and error analysis of approximations of constrained optimal control problems. His research on singularly perturbed optimal control led, among others, to the important understanding that the limit problem has to be appropriately defined and can be different from the one obtained by a formal order reduction, as done in the classical Tikhonov theorem. Asen's investigations from this period were collected in his first book [1] and in the later book [2] jointly written with T. Zolezzi.

In 1989, Asen accepted a visiting professorship at the University of Florida, where after, his research flourished with new ideas and results. In 1993, he and

William W. Hager wrote a fundamental paper on Lipschitzian stability on nonlinear control and optimization, where they provided a powerful tool for analysis of stability properties of generalized equations. The ideas of this work have a great impact on the optimization areas such as stability and error analysis of discrete approximations in optimal control.

In 1990 Asen Dontchev became Associate Editor at Mathematical Reviews and kept this position until his retirement in 2019. Meanwhile, since 2000, he became Adjunct Professor at the University of Michigan. From 2007 to 2009 he served as Program Director of the Analysis Program, Division of Mathematical Sciences of the US National Science Foundation (NSF).

Asen made important contributions in inverse and implicit function theory for set-valued mappings. In collaboration with Terry Rockafellar, he wrote his next book [3], where some basic topics on fundamental questions of variational analysis are studied: various regularity properties of set-valued mappings, implicit function theorems, radius of preservation of regularity under disturbances, and applications in numerical analysis. The concept of metric subregularity, introduced by Dontchev and Rockafellar in 2004, was systematically studied by him and his collaborators. This concept became an important instrument in the approximation theory for optimization problems. Asen also substantially contributed to the topic of constrained best approximations, and the justification of the Newton method for such problems. Newton-type methods for nonsmooth and generalized equations were a favorite topic for his entire life. Asen devoted a part of his final few years to justify and improve the method of model predictive control, a main tool for process control in the industry, aerospace engineering and power electronics.

Asen Dontchev made several outstanding contributions to analysis and optimization in more than 120 articles and six books. His last book [4], which he wrote during the months he knew he had a terminal illness, is an excellent introduction to variational analysis with a focus on optimization.

Asen also provided substantial services to the scientific community. He was member of the editorial boards of many reputed mathematical journals, such as SIAM J. of Optimization, SIAM J. of Control and Optimization, Computational Optimization and Applications, J. of Optimization Theory and Applications, J. of Dynamical and Control Systems, J. of Mathematical Analysis and Applications, J. of Industrial and Managerial Optimization, Open J. of Applied Mathematics.

Throughout his career, Asen Dontchev was a mentor of several generations of mathematicians. He was an excellent lecturer and had a remarkable

ability to disseminate his knowledge and to inspire young researchers. Due to his openness and friendliness, he had a large number of scientific contacts and visits in universities in all over the world, and more than 60 coauthors.

The papers presented in this special issue are a tribute to the memory of Asen Lyubomirov Dontchev. They are written by his friends, collaborators, former students and colleagues who have been influenced by his work, teaching, mentoring, and generous friendship.

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