Centre for Process Systems Engineering
Seminar

Lipschitz global optimization
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Abstract:

Global optimization is a thriving branch of applied mathematics and an extensive literature is dedicated to it. In this lecture, the global optimization problem of a multidimensional function satisfying the Lipschitz condition over a hyperinterval with an unknown Lipschitz constant is considered. It is supposed that the objective function can be "black box", multiextremal, and non-differentiable. It is also assumed that evaluation of the objective function at a point is a time-consuming operation. Algorithms for solving this problem discussed in the literature can be distinguished, for example, by the way of obtaining information about the Lipschitz constant and by the strategy of exploration of the search domain. Different exploration techniques based on various adaptive partition strategies are analyzed.

The main attention is dedicated to two types of algorithms. The first of them is based on using space-filling curves in global optimization. A family of derivative-free numerical algorithms applying space-filling curves to reduce the dimensionality of the global optimization problem is discussed. A number of unconventional ideas, such as adaptive strategies for estimating Lipschitz constant, balancing global and local information to accelerate the search, etc. are presented. Diagonal global optimization algorithms is the second type of methods under consideration. They have a number of attractive theoretical properties and have proved to be efficient in solving applied problems.

Bio:

Yaroslav D. Sergeyev, Ph.D., D.Sc., D.H.C. is Distinguished Professor at the University of Calabria, Italy (professorship awarded by the Italian Government) and Head of Numerical Calculus Laboratory at the same university. His research interests include numerical analysis, global optimization, infinity computing and calculus, philosophy of computations, set theory, number theory, fractals, parallel computing, and interval analysis. Prof. Sergeyev was awarded several research prizes (Pythagoras International Prize in Mathematics, 2010; EUROPT Fellow, 2016; Outstanding Achievement Award from the 2015 World Congress in Computer Science, Computer Engineering, and Applied Computing, USA; Honorary Fellowship, the highest distinction of the European Society of Computational Methods in Sciences, Engineering and Technology, 2015; The 2015 Journal of Global Optimization (Springer) Best Paper Award; Lagrange Lecture, Turin University, Italy, 2010; MAIK Prize for the best scientific monograph published in Russian, Moscow, 2008, etc.). His list of publications contains more than 200 items (among them 5 books). He is a member of editorial boards of 6 international journals. He delivered more than 50 plenary and keynote lectures at prestigious international congresses. Software developed under his supervision is used in more than 40 countries of the world. For more information see his web page http://wwwinfo.deis.unical.it/~yaro

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