THE PROGRAM

ISMP 2012

21st International Symposium on Mathematical Programming

August 19–24, 2012 · Berlin, Germany

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WELCOME TO ISMP 2012

On behalf of the ISMP 2012 Organizing Committee, the Technische Universität Berlin, and the Mathematical Optimization Society, I welcome you to ISMP 2012, the 21st International Symposium on Mathematical Programming.

The symposium covers all theoretical, computational, and practical aspects of mathematical optimization. With roughly six-hundred invited and contributed sessions, fifteen invited state-of-the-art lectures, five history lectures, totaling well over seventeen-hundred presentations, this is by far the largest ISMP so far. Roughly two-thousand participants from more than sixty countries all over the world will learn about the most recent developments and results and discuss new challenges from theory and practice. These numbers are a clear indication of the importance of Mathematical Optimization as a scientific discipline and a key technology for future developments in numerous application areas.

Berlin is an exciting city that has experienced dramatical political, economical and social changes within the past 25 years. The opening ceremony of ISMP 2012 will take place at the Konzerthaus on the historic Gendarmenmarkt which is considered one of the most beautiful squares in Europe. The conference dinner will take place at the Haus der Kulturen der Welt ("House of the Cultures of the World") located in the Tiergarten park with a beer garden on the banks of the Spree river and a view on the German Chancellery. I hope that you will also find the time to take a look around Berlin on your own, to obtain a feeling for the vibrant life style, and to explore the many attractions of this wonderful city.

Finally, I would like to express my sincere appreciation to all of the many volunteers who made this meeting possible. I wish to acknowledge, in particular, the members of the program committee, the cluster chairs, and the many session organizers for setting up the scientific program. My sincere thanks go to the members of the organizing committee and everyone involved in the local organization – the system administrators, secretaries, student assistants, PhD students, and postdocs – for the many days, weeks and even months of work.

I wish you all an enjoyable and memorable ISMP 2012 in Berlin.

Berlin, August 2012 Martin Skutella

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THE OPENING CEREMONY

The opening ceremony takes place on Sunday, August 19, 18:00, at the "Konzerthaus am Gendarmenmarkt".
Chair: Günter M. Ziegler
Musical accompaniment: Berliner Sibelius Orchester
Conducted by Vinzenz Weissenburger

Welcome addresses

- Martin Skutella
  (Organizing Committee Chair)
- Nicolas Zimmer
  (Permanent Secretary for Economics, Technology and Research of the State of Berlin)
- Paul Uwe Thamsen
  (First Vice President of the Technische Universität Berlin)
- Philippe Toint
  (Chair of the Mathematical Optimization Society)

Awards

- *Dantzig Prize* for original research which by its originality, breadth and depth, is having a major impact on the field of mathematical optimization
- *Lagrange Prize* for outstanding works in the area of continuous optimization
- *Fulkerson Prize* for outstanding papers in the area of discrete mathematics
- *Beale-Orchard-Hayes Prize* for excellence in computational mathematical programming
- *Tseng Lectureship* for outstanding contributions in the area of continuous optimization, consisting of original theoretical results, innovative applications, or successful software development
- *Tucker Prize* for an outstanding doctoral thesis: Announcement of the three finalists

Reception

The opening ceremony is followed by a reception with a magnificent view on Gendarmenmarkt.

Derivative-free and simulation-based optimization: Recent progress in direct search methods (Organizers: Luís Nunes Vicente and Stefan Wild) [p. 227]			H 3003A
Sébastien Le Digabel: The mesh adaptive direct search algorithm with reduced number of directions	José Mario Martínez: Inexact restoration method for derivative-free optimization with smooth constraints	Rohollah Garmanjani: Smoothing and worst case complexity for direct-search methods in non-smooth optimization	
Finance and economics: Modern portfolio optimization [p. 228]			H 3021
Süleyman Özekici: Portfolio selection with hyperexponential utility functions	Eligius Hendrix: On finding optimal portfolios with risky assets		
Finance and economics: Applications in finance [p. 228]			H 3027
Jonas Ekblom: Optimal hedging of foreign exchange risk in uncertain cash flows using stochastic programming	Mathias Barkhagen: An optimization based method for arbitrage-free estimation of the implied risk neutral density surface	Janos Mayer: Portfolio optimization with objective functions from cumulative prospect theory	
Game theory: New models and solution concepts I [p. 228]			MA 005
Leqin Wu: A new solution concept for cooperative games	Daniel Granot: Subgame perfect consistent stability		
Game theory: Software piracy and mastermind [p. 229]			MA 043
Yael Perlman: Software piracy prevention and price determination	Carola Winzen: Playing mastermind with many colors		
Global optimization: Advances in global optimization III [p. 229]			H 2053
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Implementations and software: Modeling languages and software III [p. 229]			H 1058
Per Rutquist: Trajectory optimization with TOMLAB/PROPT	Christian Valente: Optimisation under uncertainty: Software tools for modelling and solver support	Vincent Beraudier: Modeling best practices: How to write good optimization models efficiently thanks to IBM ILOG CPLEX Optimization Studio's Integrated Development Environment (IDE) and its debugging support.	
Integer and mixed-integer programming: Topology, clustering and separation [p. 230]			H 2013
Marcia Fampa: MILP formulation for the software clustering problem	Pedro Guillén: Natural languages with the morphosyntactic distance as a topological space	Inácio Andruski-Guimarães: Comparison of techniques based on linear programming to detect separation	
Integer and mixed-integer programming: Branch-and-price IV: Primal heuristics (Organizer: Marco Lübbecke) [p. 230]			H 2032
Christian Puchert: Large neighborhood search and diving heuristics in column generation algorithms	François Vanderbeck: Primal heuristics for branch-and-price	Michael Bastubbe: A branch-and-price algorithm for rearranging a matrix into doubly bordered block-diagonal form	
Integer and mixed-integer programming: Mixed-integer linear and semidefinite programs (Organizer: Marc Pfetsch) [p. 230]			H 2033
Sonja Mars: Approaches to solve mixed integer semidefinite programs	Nam Dung Hoang: Steiner tree packing revisited	Matthias Miltenberger: Advances in linear programming	
Life sciences and healthcare: Mathematical modeling of disease [p. 231]			MA 376
Ivan Savic: Mathematical modeling of amygdalin isolation from plum kernel using response surface methodology	Rujira Ouncharoen: Stability of HIV aphaeresis model		
Logistics, traffic, and transportation: Logistics and transportation (Organizer: Arash Asadpour) [p. 231]			H 0106
Arash Asadpour: Rounding by sampling and an $O(\log n / \log \log n)$ approximation algorithm for ATSP	Nitish Korula: Prize-collecting Steiner network problems on planar graphs	Mohammadhossein Bateni: PTAS for planar multiway cut	
Logistics, traffic, and transportation: Real-world applications [p. 231]			MA 042
Kaj Holmberg: Planning and routing in networks: Urban snow removal	Rodrigo Branchini: Fleet deployment optimization model for tramp and liner shipping		
Mixed-integer nonlinear progamming: Mixed-integer nonlinear programming (Organizer: Jon Lee) [p. 232]			MA 001
Shmuel Onn: Integer programming in polynomial time via Graver bases	Renata Sotirov: SDP relaxations for the graph partition problem	Raymond Hemmecke: N-fold integer programming in cubic time	

Game theory

Thu-3-MA 043

Software piracy and mastermind

Chair Carola Winzen, Max-Planck-Institut für Informatik

Yael Perlman, Department of Management, Bar-Ilan University (with Konstantin Kogan, Yaacov Ozinci)

Software piracy prevention and price determination

We consider a monopolistic producer offering software that is updated periodically, but, by the end of one period, a pirated version is available at a transaction cost. This presents the heterogeneous consumer with possible strategies for either buying a new product or pirating it. We address pricing and protection investment strategies to regain the profits affected by the piracy. In particular, we find that even when the transaction cost is exogenous, the producer does not necessarily want to fully price out the piracy. The decisive factor in such a case is the level of product newness relative to the transaction cost. If the producer is able to achieve high newness for the updated product relative to the transaction cost, then a high retail price ensures that he will gain the largest profit possible even though some of the demand will be lost due to piracy. On the other hand, when the transaction cost is endogenous, the producer may have two alternatives: pricing the software out or investing heavily in software protection. As newness levels rise, the option of pricing out the piracy becomes increasingly preferable.

Carola Winzen, Max-Planck-Institut für Informatik (with Benjamin Doerr, Reto Spoehel, Henning Thomas)

Playing mastermind with many colors

We consider the black-peg version of Mastermind with n holes and $k \leq n$ colors. For the most interesting case $k = n$, by combining previous approaches of Chvátal (Combinatorica 3 (1983), 325–329) and Goodrich (Information Processing Letters 109 (2009), 675–678), we show that there exists a deterministic winning strategy that allows the codebreaker to find the secret code with $O(n \log^{1/2} n)$ guesses. This improves the previously best known bounds of Chvátal, Goodrich, and others, which are all of order $n \log n$; both for the black-peg version of Mastermind and the original game with both black and white answer-pegs. More generally, one of the key arguments, the success probability of random sampling, can be applied to the Mastermind game with any number $k \leq ne^{-\log^{1/2} n}$ of colors, and it yields a winning strategy using $O(n \log k / \log(n/k))$ guesses.

Global optimization

Thu-3-H 2053

Advances in global optimization III

Chair Duy Van Nguyen, Universität Trier

Tibor Csendes, University of Szeged (with Elvira Antal)

Symbolic simplification of nonlinear optimization problems

We present a Maple implementation of a symbolic algorithm that is capable to transform the original nonlinear global optimization problem into an equivalent form, that is simpler in the sense that it has less operations to be calculated. The algorithm can also recognize redundancy in the optimized variables, and in this sense it can decrease the dimensionality of the problem (if it is possible). The applied transformations can preserve the number of local minimizer points, and the solution of the transformed problem can easily be transformed back to the space of the original variables.

We have tested the code on the set of standard global optimization problems and on some custom made simplifiable problems. The results are convincing in terms that the algorithm concluded in almost all cases according to our knowledge on the problems.

Csendes, T. and T. Rapcsák: Nonlinear Coordinate Transformations for Unconstrained Optimization. I. Basic Transformations. J. of Global Optimization 3(1993) 213–221.

Chu Nguyen, Eastern Asian University of Technology (with Nguyen Chu, Pham Duong, Le Hue)

The interior exterior approach for linear programming problem

In this paper we present a new interior exterior algorithm for solving linear programming problem which can be viewed as a variation of simplex method in combination with interior approach. With the assumption that a feasible interior solution to the input system is known, this algorithm uses it and appropriate constraints of the system to construct a sequence of the so called station cones whose vertices tend very fast to the solution to be found. The computational experiments show that the number of iterations of the interior exterior algorithm is significantly smaller than that of the second phase of the simplex method. Additionally, when the number of variables and constraints of the problem increase, the number of iterations of the interior exterior approach increase in a slower manner than that of the simplex method.

Duy Van Nguyen, Universität Trier

Solving standard problem (StQP)

We consider the standard quadratic problem (StQP) which consists of globally minimizing an indefinite quadratic function over the simplex. We propose a a finite but exponential solution algorithm in which the main task of each iteration is to check semidefiniteness of a $k \times k$ symmetric matrix with $k \leq n$. We show some illustrative examples and computational test results for the algorithm.

Implementations & software

Thu-3-H 1058

Modeling languages and software III

Chair Robert Fourer, AMPL Optimization

Per Rutquist, Tomlab Optimization (with Marcus Edvall, Kenneth Holmström)

Trajectory optimization with TOMLAB/PROPT

We demonstrate an easy-to-use symbolic interface for trajectory optimization, and for general linear and nonlinear programming, using Matlab syntax.

PROPT allows ordinary differential equations (as well as more general differential algebraic equations) to be converted into optimization constraints using pseudo-spectral collocation. Multi-phase problems and links to time-independent equations are also handled in a straightforward manner.

Equations are entered via the symbolic interface TOMSYM, which automatically generates the linear constraint matrix as well as derivatives of nonlinear functions. These are then integrated with the entire TOMLAB suite of solvers, which includes mixed-integer optimization with KNITRO and MINLPBB and global optimization with multiMin. As a result, we achieve very good results on many problems described as "hard" in literature. As illustration, we present solved examples from robotics, aerospace, process control and parameter estimation.

Christian Valente, OptiRisk Systems (with Gautam Mitra, Victor Zverovich)

Optimisation under uncertainty: Software tools for modelling and solver support

Algebraic modelling languages are now well established as a formulation tool used by practitioners and academics in the field of operational research. We describe an integrated modelling and solver platform for investigating stochastic and robust optimisation models. We consider the following well known approaches: stochastic programming (SP) with recourse, chance constrained programming, integrated chance constrained programming, and robust optimisation.

In an earlier work Valente et al. introduced Stochastic extensions of AMPL called SAMPL. The extended language constructs are used to represent two- and multi-stage SP problems. In this paper we describe a set of extensions to SAMPL for representing robust optimisation problems and the additional classes of SP problems listed above. We not only describe syntax and semantics of the extensions but also discuss solver requirements, reformulation techniques and connection between the modelling system and external solvers. In particular, we show that direct representation of some of the modelling constructs not only makes the models easier to understand but also facilitates the use of specialised solution algorithms.

Vincent Beraudier, IBM Industry Solution (with Ferenc Katai, Arnaud Schutz)

Modeling best practices: How to write good optimization models efficiently thanks to IBM ILOG CPLEX Optimization Studio's Integrated Development Environment (IDE) and its debugging support

A good optimization model has to execute fast, but also it has to be scalable to adapt to changes in data and/or constraints. Therefore at development time, debugging support is a crucial factor to deliver scalable optimization models into solutions. This interactive demo will show the debugging capabilities to deal with optimization model testing in IBM ILOG CPLEX Optimization Studio. The talk will consist in a showcase on an application developed by IBM. It will describe in fair amount of details how OPL language and its IDE helps its users to detect memory and time bottlenecks in an optimization model. It will show how OPL provides its users introspection mechanisms to detect issues early on, to avoid them, and eventually to eliminate errors as soon as possible in the development process. We will also discuss how the OPL language and Studio ensure quality throughout the entire application life-cycle, from design to deployment.