ISMP2018 BORDEAUX

23rd International Symposium on Mathematical Programming

July 1 - 6

The World Congress of Mathematical Optimization

Held triennially on behalf of the Mathematical Optimization Society

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23*rd* International Symposium on Mathematical Programming (ISMP)

The World Congress of the Mathematical Optimization Society (MOS)

Bordeaux, July 1-6, 2018

Contents

Welcome Address

It is a great pleasure to welcome all of you to Bordeaux for this triennial international congress of mathematical optimization. ISMP is the symposium of the Mathematical Optimization Society (MOS). It gathers scientists from all over the world as well as industrial practitioners of mathematical optimization. Attendees present their most recent developments and results and discuss new challenges from theory and practice.

This 23rd edition of the symposium is organized by the mathematical optimization group of the University of Bordeaux with the contributions of other mathematical optimization researchers of the French community. The core of the local organizers is structured around the Inria project team Realopt which is a joint venture between the University, Inria and two CNRS research labs of the University: the Mathematics Institute (IMB - team OPTIMAL - in Mathematical Optimization, Stochastic Models and Statistics) and the Computer Science Lab (LaBRI - team Combinatorics and Algorithms). The practical organization is taken care of by the congress office of the University of Bordeaux, the communication office of Inria-Bordeaux, and the ADERA congress service, with the support of the University of Bordeaux Initiative of Excellence (Idex) and the Regional authorities of Nouvelle-Aquitaine.

This edition is the outcome of a collaborative venture involving the participation of many members of the international community. The program committee has done a great job in reaching out to invited speakers. It was headed by Michael Jünger who has also been so active in driving the special issue of Math Programming B. Through the scientific committee, we have put many people to work for co-opting invited sessions and performing the immense editorial task of gathering talks into sessions. The support services of our institutions and the local team have been largely put to contribution on all aspects of the organization. We want to highlight the tremendous job done by our engineers, Philippe Depouilly and Laurent Facq, to setup the editorial platform, and by our colleagues to optimize the schedule, in particular Pierre Pesneau who implemented the scheduler, while our students have contributed to deliver automation tools. Last but not least, we are deeply grateful to the cohort of volunteer students and staff who are key elements of the logistical organization during the ISMP week.

The happening is yours. Your scientific contributions are feeding the interesting program which we shall all benefit from. So thank you for your participation and let us enjoy this congress, learn from it, and build the network of your future collaborations.

François Vanderbeck
University of Bordeaux
& Inria Bordeaux

and on large randomly generated instances.

2 - A Matheuristic Approach to the Hospital Facility Layout Problem

Speaker: Anders Gullhav, NTNU, NO, talk 1019

Co-Authors: *Henrik Andersson*, *Bjørn Nygreen*, *Vilde Kvillum*, *Anne Marit Vigerust*,

When building or reconstructing a hospital, a decision of great importance is to design its internal layout. We consider the Hospital Facility Layout Problem (HFLP), where a diverse set of hospital functions, such as operating rooms, bed wards, medical imaging labs, and emergency rooms, has to be assigned unique locations. A layout that reduces the amount of transportation of patients, personnel and materials is desirable in terms of operational effectiveness. We formulate the HFLP as an IP, whose objective function is to minimize the transportation costs between pairs of functions, expressed as the product of the functions' relatedness and distance between their assigned locations. Hence, the problem contains a quadratic assignment problem. To solve real-world instances, we propose a matheuristic approach that is based on iteratively solving relaxed IPs of the original problem. To our knowledge, our approach is novel within the HFLP literature. Moreover, we present results from artificial and real-world instances, which show the applicability of our approach.

3 - A Multi task robot layout optimization with inventory lot-sizing problem

Speaker: Hanane Khamlichi, FST - Tangier, MA, talk 1328

Co-Authors: *Kenza Oufaska*, *Rachid Dkiouak*, *Tarik Zouadi*,

Recognizing that many factors must be considered in choosing how to layout a facility. A suitable flexible facility layout planning is necessary to enhance efficiency, and flexibility in any manufacturing environment. Today, the factories understand that choosing a layout type has significant impact on the ability of the firm to compete in the market and its long-term success. The strategy of Adopting one fixed layout without considering the demand changes causes additional manufacturing costs and increases jobs tardiness. Cellular manufacturing (CM) concept is derived from a group technology (GT) concept. Today, this concept is used in many companies to enhance flexibility, reduce set up, handling and inventory costs and optimize the factories layout. The objective is to group a set of problem, thus a single solution can be found to a set of problems, which leads the companies to save money and efforts. In this work, we propose a multi-period model to determine the best cell formation and the necessary configurations over each period. The model integrates the robots cell formation decisions, the group layout and the lot-sizing problem, and aims to minimize intra and inter-cell materials handling, and robot's relocation. The paper proposes a MIP formulation for the problem, which is solved using commercial software CPLEX, also we present a hybrid genetic algorithm to solve the problem. Computational results on several randomly generated instances show the effectiveness of the proposed approaches.

Algorithms for nonlinear conic problems

Continuous Optimization

SDP - Mo 3:15pm-4:45pm, Format: 3x30 min

Room: Salle LC5 Building: L, Intermediate 1, Zone: 10

Contributed Session 463

Chair: Takayuki Okuno, RIKEN AIP, JP

1 - Augmented Lagrangian for nonlinear SDPs applied to the covering problem

Speaker: Leonardo Mito, IME-USP, BR, talk 1570

Co-Authors: *Gabriel Haeser*, *Ernesto Birgin*, *Daiana Viana*, *Walter Bofill*,

In this work we present an Augmented Lagrangian algorithm for nonlinear semidefinite programs (NLSDPs), which is a natural extension of its consolidated counterpart in nonlinear programming. This method works with two levels of constraints, one that is penalized and other that is kept within the subproblems. This is done in order to allow exploiting the subproblem structure while solving it. The global convergence theory is based on recent results regarding approximate Karush-Kuhn-Tucker optimality conditions for NLSDP, which is stronger than Fritz John optimality conditions that are usually employed. Additionally, we approach the so-called sphere covering problem exploiting some convex algebraic geometry results, such as Stengle's positivstellensatz and its variations. The problem can be written in terms of a standard NLSDP using Gram representations for real polynomials that are sums of squares of other polynomials. Numerical experiments are presented.

2 - Long-Step Path-Following Algorithm for Nonlinear Symmetric Programming Problems

Speaker: Cunlu Zhou, University of Notre Dame, US, talk 667

Co-Authors: *Leonid Faybusovich*,

We develop a direct long-step path-following algorithm for a class of symmetric programming problems with nonlinear convex objective functions. The direct approach allows us to consider linear equality constraints in explicit form and use all of the structural properties of a natural formulation of the problem. We establish the complexity estimates similar to the case of a linear-quadratic objective function. We also present the numerical results for the class of optimization problems involving quantum (von Neumann) entropy.

3 - A primal-dual path following method for nonlinear semi-infinite SDPs

Speaker: Takayuki Okuno, RIKEN AIP, JP, talk 704

Co-Authors: *Masao Fukushima*,

In this talk, we consider nonlinear semi-infinite programs with semi-definite matrix constraints and infinitely many convex inequality constraints, called NSISDP for short. Although the NSISDP has important applications such as FIR filter design problems, robust beam forming problems, and so on, it has not been studied sufficiently so far. Our aim in this research is to design a new algorithm for the NSISDP. We actually propose an algorithm that follows central path consisting of barrier KKT points of the NSIDP. To achieve a rapid convergence, we incorporate the local reduction SQP method into the above algorithm. Also, we find a dual optimal matrix solution associated to the semi-definite constraint by solving scaled Newton equations. The proposed method may be viewed as an extension of the primal-dual interior point method for the nonlinear SDPs proposed by Yamashita, et al (2012) (H. Yamashita, H. Yabe, and K. Harada, A primal–dual interior point method for nonlinear semi-definite programming, Mathematical Programming, 135 (2012), pp.