The International Conference on Continuous Optimization (ICCOPT)

Santiago, Chile 2010

Winter school. July 24-25, 2010
Conference. July 26-29, 2010

for Tseng's modified forward-backward splitting method for finding a zero of the sum of a monotone Lipschitz continuous map with an arbitrary maximal monotone operator whose resolvent is assumed to be easily computable. Using also the framework of the HPE method, we study the complexity of a variant of a Newton-type extragradient algorithm proposed by Solodov and Svaiter for finding a zero of a smooth monotone function with Lipschitz continuous Jacobian.

3. Randomized projection algorithms for convex minimization

Angelia Nedich, University of Illinois, 117 Transportation Building, USA, angelia@illinois.edu

This talk is on random projections for constrained convex minimization problems, where the constraint set is specified as the intersection of finitely many "simple" constraints. The proposed algorithms are applicable to the situation where the whole constraint set of the problem is not known in advance, but it is rather learned in time through observations. We discuss the proposed algorithms for the case when the projection on the individual constraints is available in a closed form. We also consider the modification of the algorithms to deal with the case when each individual constraint is given by a convex inequality. The behavior of the algorithms is investigated both for diminishing and non-diminishing stepsize values.

■ MB02

Room H005 - Monday 13:30–15:00

Cluster
Optimization in Chemical Engineering
Organizers: I. Grossmann, L.T. Biegler

Optimization in Chemical Process Design

Invited session
Chair: Ignacio Grossmann

1. Optimization of biotechnological processes through a combined optimization-simulation approach

José Ricardo Pérez-Correa, P. Universidad Católica de Chile, Vicuña Mackenna 4860, Santiago, Chile, perez@ing.puc.cl / Co-authors: G. Guillén-Gosálbez, Robert Brunet, José A. Caballero, Laureano Jiménez

Here, we combine a widely used simulation package and optimization tools to develop a new method for designing biotechnological processing plants. This is formulated as a mixed-integer dynamic optimization (MIDO) problem solved by a reduced-space decomposition method that iterates between primal and master sub-problems. The primal level entails the solution of a dynamic nonlinear programming subproblem in which integer decisions, mainly the type and number of equipments in parallel, are fixed. This primal problem is solved by integrating the process simulator with an external optimization package. On the other hand, the master level is a tailor made heuristic that does not rely on any mixed-integer linear programming (MILP) formulation; therefore, reducing the effect of the non-convexities of the model. Both levels of the algorithm are solved iteratively until a termination criterion is reached. The application of this methodology to a typical fermentation process resulted in an improved economic performance.

2. Optimization of CO2 capture process using an aqueous MEA solution

Patricia Mores, CAIMI, UTN-FRRo, Escurra 2879, Funes, Santa Fé, Argentina, patricia.mores@gmail.com / Co-authors: Nicolás Scenna, Sergio Mussati

This paper presents a NLP mathematical model to optimize the operating conditions of the chemical absorption process to CO2 removal using MEA aqueous solution. The optimization design problem is to maximize the CO2 absorption efficiency to reach desired CO2 reduction targets. The entire post-combustion CO2 process is modeled in detail. Temperature, composition and flow-rate profiles of the aqueous solution and gas streams along the absorber and regenerator, condenser and reboiler heat duties for amine regeneration are considered as optimization variables. Dimensions of the absorber and regenerator columns as well as the CO2 composition in flue gas are treated as model parameters. GAMS (General Algebraic Modeling System) and CONOPT are used, respectively, to implement and to solve the resulting mathematical model. The proposed model can not only be used as optimizer but also as a simulator. Detailed discussion of results is presented through different case studies.

3. Strategy for optimization of CCGT power plants by solving a simple non-linear equations system and constraint equations

Ezequiel Godoy, CAIMI - FRRo - UTN, Zeballos 1346, Rosario, Santa Fé, Argentina, ezgodoy@frro.utn.edu.ar / Co-authors: Sonia Benz, Nicolás Scenna

A strategy for the solution of the optimization problem of minimum cost of combined cycle gas turbine power plants is presented. Specific relationships, valid at the optimal solution, among selected decision variables are used to introduce new constraints to the optimization problem. Then, the feasible region is reduced to a "single point", and the resolution strategy becomes equivalent to solving the resultant set of non-linear equations system and constraint equations so achieved to optimize the system. This approach can also be used to achieve reduced models for real time optimization problems.

■ MB03

Room H006 - Monday 13:30–15:00

Semidefinite Programming

Contributed session
Chair: Mituhiro Fukuda

1. SDP relaxation for polynomial optimization problems and facial reduction algorithm

Hayato Waki, The University of Electro-Communications, Choufu-gaoka 1-5-1, Choufu-shi, Tokyo, Japan, waki@cs.uec.ac.jp / Co-author: Masakazu Muramatsu

In this talk, we give an SDP problem obtained by Lasserre's SDP relaxation for a one-dimensional polynomial optimization problem (POP). The standard SDP solvers, such as SeDuMi and SDPA, return the significantly wrong value as the optimal value of the SDP problem, but the returned value is equal to the optimal value of the POP. One of reasons for this strange result is that the SDP problem is very sensitive to the numerical errors in computation of the interior-point methods. Moreover, we show that Facial Reduction Algorithm (FRA) proposed by Borwein and Wolkowicz works for the SDP problem effectively. In general, FRA generates an SDP with an interior feasible solution from a given SDP. In our case, we obtain a simple linear programming problem by applying FRA into the SDP relaxation problem and find the correct optimal value.

2. Local convergence for sequential semidefinite programming

Rodrigo Garcés, Universidad de la Frontera, Temuco, Chile, r.garces02@ufromail.cl / Co-authors: Walter Gómez, Florian Jarre

We examine the local convergence of the sequential semidefinite programming algorithm for solving optimization problems with nonlinear semidefiniteness constraints. The papers [1,2] present a proof of local quadratic convergence of this algorithm under the assumption of certain second order sufficient condition for a local minimizer. The present work changes the analysis of [1] to a weaker second order sufficient condition and obtains the same convergence result.

[1] B. Fares, D. Noll and P. Apkarian (2002): Robust control via sequential semidefinite programming. SIAM J. Control Optim. 40, 1791-1820.

[2] R.W. Freund, F. Jarre and Vogelbusch (2007): Nonlinear semidefinite programming: sensitivity, convergence, and an application in passive reduced-order modelling. Math Programming, 109(2-3):581-611.

3. Solving large-scale semidefinite programs from quantum chemistry

Mituhiro Fukuda, Tokyo Institute of Technology, 2-12-1-W8-41 Oh-okayama, Meguro-ku, Tokyo 152-8552, Japan, mituhiro@is.titech.ac.jp / Co-authors: Maho Nakata, Katsuki Fujisawa

The electronic structure calculation is one of the fundamental problems in quantum chemistry. Using the non-traditional reduced density matrix formulation of the problem, we obtain an extremely large-scale semidefinite program. The advantage of this formulation is that it is a more elegant approximation of the original problem in terms of its physical and chemical properties. We recently made a major update in our parallel semidefinite program solver SDPARA 7 which allow us to solve much larger problems in a shorter time using a cluster computer or a super computer with multi-core CPUs. We will report these recently innovations we made in the solver, and some numerical results on extremely large-scale semidefinite programs.

For further information, visit : http://iccopt2010.cmm.uchile.cl