

2 - Parallel machine scheduling with a variable common due window

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We study problems of scheduling jobs on identical parallel machines, with a common due window to be assigned to all jobs. The objective is to minimize the sum of job earliness, job tardiness, due window location and size costs, which are nondecreasing job independent functions. Solution properties are established and dynamic programming algorithms are derived. Polynomial algorithm is given for the single machine case, in which the due window size cost is a discretely convex or concave nondecreasing function and all the other cost functions are linear.

3 - Structural properties of time-dependent scheduling problems with the l_p norm objective

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We consider structural properties of single-machine time-dependent scheduling problems with linearly deteriorating jobs and the l_p norm objective. We prove that the V-shape property, previously known only for $p=1$, still holds for infinite many $p>1$, while the symmetry property does not hold for $p \gg 1$. We show that for $p>1$ the problems possess a kind of matrix convexity. Finally, we express the complexity of the problems as a function of index p of the norm.

4 - Scheduling jobs with values dependent on their completion times

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We consider two scheduling problems with job values and losses of job values (costs) dependent on job completion times. In the first problem, we consider scheduling jobs with stepwise values deteriorating over time. We prove strong NP-hardness of a single processor case and construct a pseudo-polynomial algorithm for a special case with unrelated processors. The second problem is a single processor one with piecewise linear losses of job values increasing over time. We prove strong NP-hardness of the problem and existence of a pseudo-polynomial algorithm for its special case.

2 - Bilevel optimization in stability analysis of nonlinear dynamical systems

Max Demenkov, Institute of Control Sciences, Lab 16, Russian Academy of Sciences, 65 Profsoyuznaya str., 117997, Moscow, Russian Federation, demenkov@ipu.ru

We consider region of attraction for a dynamical system - a set of points from which system trajectories go to a stable equilibrium. One can estimate it via the sublevel sets of a positive definite Lyapunov function, which is decreasing along any trajectory in the region. We formulate this task as a bilevel optimization over the function parameters and system state variables. On the lower level we have minimization of the function with nonconvex equality constraint. On the upper level a size estimation of a sublevel set needs to be maximized. Local improvement algorithm is discussed.

3 - Numerical solution of nonlinear optimal control problems, A comparative study

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The aim of this paper is to compare four different iterative numerical techniques using in determination the optimal control law. The methods are: Steepest Descent (SD), Variation of Extremals (VE), Quasilinearization (QL) and Collocation (CL).

The Maximum radius orbit transfer in a given time problem is solved utilizing these methods and comparisons are made in the terms of accuracy, the rate of convergence, sensitivity to initial guess and the time of computer processing. The results show that, CL method has the least error, VE has the most sensitivity to initial guess.

4 - Performance Analysis of Partial Use of Local Optimization Operator on Genetic Algorithm for TSP

Milan Djordjevic, UP DIST, UP FAMNIT, Glagoljaska 8, Slovenia, 6000, Koper, State, Slovenia, milan.djordjevic@student.upr.si, *Andrej Brodnik*

We study the influence of hybridization of a genetic algorithm with a local optimizer on instances of a TSPLIB. In tests we applied hybridization at various percentages of genetic algorithm iterations. Less frequent application of hybridization decreased the average running time, whereas the quality of solution on average deteriorated only from 0.21% till 1.40% worse than the optimal solution. We studied at which iterations to hybridize. We applied it at random iterations, at the initial iterations, and the ending ones, and proved where being the best.

MD-15

Monday, 14:30-16:00

RB-2101

Nonlinear Optimization and Applications 3

Stream: Nonlinear Programming

Invited session

Chair: *Max Demenkov*, Institute of Control Sciences, Lab 16, Russian Academy of Sciences, 65 Profsoyuznaya str., 117997, Moscow, Russian Federation, demenkov@ipu.ru

1 - Multistart Coupled with a Derivative-Free Filter Local Search for Locating Multiple Solutions

Florbela P. Fernandes, Department of Mathematics - ESTiG, Polytechnic Institute of Bragança, Bragança, Portugal, florbela@ipb.pt, *M. Fernanda P. Costa*, *Ana I. Pereira*, *Edite M.G.P. Fernandes*

A multistart technique coupled with a derivative-free filter local search algorithm for locating all the optimal solutions of a nonconvex constrained optimization is presented. To reach fast convergence to optimal solutions, the local search procedure is based on descent directions. The filter-set concept is introduced to handle the constraints of the problem. The direction vector is descent for the objective function if the point is feasible; otherwise, it is descent for the constraint violation. Numerical experiments with benchmark problems and a comparison with other methods are included.

MD-16

Monday, 14:30-16:00

RB-2103

Uncertainty Analysis in Energy and Water Resources

Stream: Uncertainty and Perturbations in Optimization and in Environmental and Energy Modelling

Invited session

Chair: *John Boland*, School of Mathematics and Statistics, University of South Australia, Mawson Lakes Blvd., 5095, Mawson Lakes, South Australia, Australia, john.boland@unisa.edu.au

1 - Reconciling rainfall modelling on differing time scales

John Boland, School of Mathematics and Statistics, University of South Australia, Mawson Lakes Blvd., 5095, Mawson Lakes, South Australia, Australia, john.boland@unisa.edu.au, *Julia Piantadosi*

Rainfall perform well for the time scales on which they are produced but for other time scales, a model's performance can be erratic. Previous experience in estimating five minute variance of wind farm output derived from modelling ten second output series (Agrawal et al 2010) has led us to be able to perform a similar exercise with modelling daily