■ FB-12

Friday, 10:30-12:00 - Room 004

Scheduling Models in Operational Decision Making

Stream: Scheduling under Resource Constraints
Invited session
Chair: *Joanna Jozefowska*
Chair: *Francisco Ballestin*

1 - ORAS: Route Optimization System for the Hospital at Home Service
Sacramento Quintanilla, Francisco Ballestin, M.Pilar Lino, M. Angeles Pérez, Vicente Valls

ORAS is a mobile route-planning application developed for use in the home hospitalization (HH) service. Doctors and nurses who provide HH services must travel by taxis to different homes where their patients are hospitalized. The software is designed to show daily the most efficient route to be taken by each doctor and nurse and to update in real time the information about the routes. A graphic visualization is used to show the routes taken by each taxi or person. The core is a set of algorithms that achieves a significant reduction in both cost and staff waiting times.

2 - Decomposition of a Storage and Retrieval Problem in a Warehouse
M. Angeles Pérez, Francisco Ballestin, M.Pilar Lino, Sacramento Quintanilla, Vicente Valls

We work with a warehouse where some forklifts have to store and retrieve pallets, with the objective of performing the given orders in the minimum time possible. The warehouse works with random storage: any pallet can occupy different positions. In our problem three block of decisions have to be made: 1) in which position to store or retrieve a pallet, 2) which forklift is going to work with each pallet, and 3) when exactly each order is going to be performed. We decompose our problem into three different subproblems to solve it. Each of the subproblems is assigned to one block of decisions.

3 - Metrics and Approximated Solution of Machine Scheduling Problems
Alexander Lazarev

In this paper, we propose a new approximation scheme for scheduling problems. The scheme is based on search for the polynomially solvable instance which has a minimal distance in the metric from the original instance. One can also improve the scheme by constructing new metrics and finding new polynomially solvable cases of scheduling problems.

4 - Scheduling an Injection Plant with Order Dependent Setups
Joanna Jozefowska, Marek Goslawski, Marcin Kulus, Jenny Nossack

A scheduling problem observed in an injection molding plant is presented. The problem involves time consuming changeover operations. The objective is to maximize the plant productivity. Scheduling constraints follow from limited availability of staff responsible for the changeovers. A two stage approach is proposed. At the first stage jobs are assigned to machines and the order of jobs on each machine is fixed. At the second stage the operators are assigned to machines. The schedules are compared with schedules generated by a dedicated greedy heuristics and by an experienced dispatcher.

■ FB-13

Friday, 10:30-12:00 - Room 123

Scheduling Applications 2

Stream: Scheduling
Invited session
Chair:
Chair: *Greet Vanden Berghe*

1 - Scheduling Patients for Surgery
Chris Potts, Marion Penn, Paul Harper

Patients are referred to hospital for surgery and a scheduling policy determines the day of their operation. Emergencies must be treated immediately, while other patients have due dates that depend on their condition. Scheduling rules depend on whether the booking for a patient is immediate or can be delayed, the priority rule among patients to be booked, and the order in which potential booking dates are searched. Using data from a case study, we evaluate our scheduling rules using: due dates being met; average patient waiting time; operating theatre overruns; and fairness to patients.

2 - Hot Strip Mill Scheduling under Consideration of Energy Consumption
Karen Puttkammer, Matthias Gerhard Wichmann, Thomas Spengler

In steel industry hot rolling is an energy intensive process as steel slabs need to be heated before being rolled on the hot strip mill. The energy consumption is determined by the production schedule. Due to rising energy prices decision support for the hot strip mill scheduling problem (HSMSP) under consideration of energy consumption becomes necessary. This contribution is based on a new MILP formulation. Therein the energy requirement for heating is modeled according to causation. We propose a problem specific heuristic solution approach and present first numerical results.

3 - Reception, Mixture and Delivery of Crude Oil in a Terminal
Bernardo Zimberg, Eduardo Camponogara, Enrique Ferreira

This paper refers to the reception, mixture and delivery of crude oil. Each tank at the terminal receives different qualities from different cargos that arrive in predefined periods. Transfer is allowed between tanks and the main pipeline to the refinery. There is a schedule of crude oil quality mixtures and volumes required by the refinery. The problem consists in finding an optimized schedule that meets the constraints. An MILP model is proposed, analyzed, and solved for a specific case. The tool can be applied to determine the optimal schedule of crude oil operations over a time horizon.

4 - Optimal Scheduling for Storage and Retrieval of Assembly Blocks in Temporary Storage Yard for Shipbuilding Process
Byung-Hyun Ha, Jung-Ryoul Son

This paper studies scheduling of storing and retrieving assembly blocks in a temporary storage yard for shipbuilding process. The objective is to minimize the number of relocations of blocks subject to the storage and retrieval time windows being satisfied. We show the problem is NP-hard and present a mixed-integer programming model based on multi-commodity network flows. The revised models are proposed by investigating the properties in the problem. To overcome the computational inefficiency, an A* algorithm is devised and the performance is validated through the numerical experiments.

■ FB-14

Friday, 10:30-12:00 - Room 124

Shop Scheduling

Stream: Scheduling
Invited session
Chair: *Waldemar Kaczmarczyk*

1 - Some Finite Planning Horizon Inspection Models with Non-Negligible Inspection Times
Honest Chipoyera

Finite planning horizon Inspection models with non-negligible inspection times are developed for a system whose time to failure has a known probability distribution. Two scenarios are explored: 1) inspections take place while the system is running, 2) whenever the system has to be checked, it is switched off completely. For these two scenarios, two sub-scenarios each are studied: a) all inspections are of the same fixed duration and b) inspection times are random variables following a known probability distribution. Maximization of profit is used as the sole optimization criterion.