

In this work we present a heuristic and an integer linear programming model for the problem of minimizing the number of saw machine cycles. The heuristic uses the idea of generating cutting patterns that can be repeated many times in association with an approximated resolution of an integer programming model. The model is solved using column generation and a rounding method. The results of some computational experiments are presented using randomly generated instances.

## ■ MC-17

Monday 12:00-13:20

Rheinaue

### Resources in machine scheduling

Stream: Scheduling under Resource Constraints

*Invited session*

Chair: *Joanna Jozefowska*, Institute of Computing Science, Poznań University of Technology, Piotrowo 2, 60-965, Poznań, Wielkopolska, Poland, [jjozefowska@cs.put.poznan.pl](mailto:jjozefowska@cs.put.poznan.pl)

#### 1 - Resource-constrained flowshop scheduling with resource recycling operations included

*Hsiao-Lan Huang*, Institute of Information Management, National Chiao Tung University, 1001, University Road, 300, Hsinchu, Taiwan, [lan0903@gmail.com](mailto:lan0903@gmail.com), *T.C. Edwin Cheng*, *Bertrand Lin*

This paper studies a generalization of the relocation problem which is formulated from a redevelopment project into a resource-constrained project scheduling problem. In the basic relocation problem, the redevelopment of a building is treated as a single job. In this paper, we separate the demolishing process and reconstruction process, each is performed by an independent crew. We formulate this setting into a resource-constrained scheduling problem in a two-machine flowshop. Optimality properties will be addressed. We also discuss the complexity status of several special cases.

#### 2 - Exact methods for the hybrid flowshop problem with batching machines

*Adrien Bellanger*, Ecole des mines de Nancy, LORIA - INRIA Nancy Grand est, École des mines de Nancy (INPL) - LORIA, projet ORCHIDS, Parc de Saurupt, CS 14 234, 54042, NANCY CEDEX, France, [adrien.bellanger@loria.fr](mailto:adrien.bellanger@loria.fr), *Ammar Oulamara*

In this abstract, we consider makespan minimization in the two-stage hybrid flowshop. The first stage contains several identical machines and the second stage contains several batching machines. Processing time of each task is given by an interval on batching machines, and tasks of a same batch have to share a common processing time. We present two branch and bound methods to solve this problem. Direct method solves the previous problem, whereas reverse method solves the reversed problem. Several computational experiments will be presented to show the efficiency of our method.

#### 3 - Resource allocation with apportionment methods

*Joanna Jozefowska*, Institute of Computing Science, Poznań University of Technology, Piotrowo 2, 60-965, Poznań, Wielkopolska, Poland, [jjozefowska@cs.put.poznan.pl](mailto:jjozefowska@cs.put.poznan.pl), *Wieslaw Kubiak*, *Lukasz Jozefowski*

Allocation of resources is main task of any scheduling system. From the client point of view fairness is one of the most important issues. This criterion is often considered in the control of IT systems where clients compete for shared resources. The most popular approaches aim at minimization of Relative Fairness Bound (RFB) and Absolute Fairness Bound (AFB). Both problems can be generalized to proportional allocation of any discrete resource. We prove that the optimization of the RFB leads to the Alabama paradox found in the apportionment theory and propose an algorithm to minimize AFB.

#### 4 - A general branch-and-bound algorithm for fair division problems

*Rudolf Vetschera*, Dept. of Business Administration, University of Vienna, Bruenner Str. 72, A-1210, Vienna, Austria, [rudolf.vetschera@univie.ac.at](mailto:rudolf.vetschera@univie.ac.at)

We introduce a branch-and-bound algorithm for solving fair division problems with indivisible items. Unlike similar algorithms, our algorithm is applicable to a wide class of fairness criteria. Computational results show that it exhibits very good performance for a considerable number of problem instances. Main applications of the algorithm are computational studies of fair division problems. In these problems, a relatively small number of items  $s$  is considered, so an exact algorithm can be used even though the problem is a generalization of the set partitioning problem, which is NP-complete.

## ■ MC-18

Monday 12:00-13:20

Lenné

### Modern Applications of Mathematical Programming I

Stream: Mathematical Programming

*Invited session*

Chair: *Diethard Pallaschke*, Statistics and Mathematical Economics, University of Karlsruhe, Kaiserstr. 12, Geb. 11.40, D-76128, Karlsruhe, Germany, [lh09@rz.uni-karlsruhe.de](mailto:lh09@rz.uni-karlsruhe.de)

Chair: *Ryszard Urbanski*, Faculty of Mathematics and Computer Science, Adam Mickiewicz University, Poznan, ul. Umultowska 87, PL-61-614, Poznan, Poland, [rich@amu.edu.pl](mailto:rich@amu.edu.pl)

Chair: *Gerhard-Wilhelm Weber*, Institute of Applied Mathematics, Middle East Technical University, ODTÜ, 06531, Ankara, Turkey, [gweber@metu.edu.tr](mailto:gweber@metu.edu.tr)

#### 1 - Optimization of the investments' distribution by the stages of the joint implementation projects' realisation

*Vlad Kucher*, -, 04111, Kiev, [commastergm@gmail.com](mailto:commastergm@gmail.com)

Some problems of joint implementation project realization (JIP) arising while investments are mobilized for such projects directed toward energy efficiency increase and GG emissions' mitigation with respect to the Kyoto Protocol are considered. Fuzzy-set estimate introduced for JIP allows estimating investment process efficiency. Problem of investments' distribution optimisation with respect to the project stages is solved as a problem of fuzzy mathematical programming. Problem posting supposes optimisation of investment distribution with respect to the project stages aimed in maximal NPV effect under limitations on emissions' normalized Kyoto levels and on the budget of the investor.

#### 2 - On stability of the mpcc feasible set

*Vladimir Shikhman*, Dept. Mathematics, RWTH Aachen University, Templergraben 55, 52056, Aachen,