

DM204 - Assignment N. 4

Exercise 1: Multicommodity Flow

In assignment N.2 the task was to model the warehousing of seasonal products as a multicommodity flow problem. Now show how to apply to the linear program defining the multicommodity flow model:

- the Lagrangian relaxation method. Describe the solution algorithm: identifying how to solve the LP of the Lagrangian relaxation, how to solve the Lagrangian multiplier problem, which is a lower bound to the original problem.
- column generation. Reformulate the problem using as variables the flows on paths from source to tank for each commodity. Then show how we can delay the generation of columns in an iterative procedure. Identify lower and upper bounds of the iterative algorithm and tell whether they are monotonic or not.
- Dantzig-Wolfe decomposition with delayed column generation.

Exercise 2: MIP for Flow Shop Problem

Write a mixed integer linear program solving the flow shop problem. A possible way to do this is to model the start time of a job by a binary variable and introduce auxiliary variables indicating the waiting time of jobs from one machine to another and the idle times of the machine in processing two successive jobs.

Implement the model in ZIMPL and try solving some of the instances available at: <http://ina2.eivd.ch/Collaborateurs/etd/problemes.dir/ordonnancement.dir/ordonnancement.html>. Report the results.

Exercise 3: CP for Flow Shop Problem

Choose a system between COMET <http://dynadec.com/support/downloads/> and Gecode www.gecode.org and write on paper a model in constraint programming that would solve the flow shop problem. This implies choosing the variables and using the global constraints that are available in the system to impose the feasibility of a schedule.

You can then implement the model and try solving the same instances of Exercise 3.