A Hybrid MIP-CP Algorithm for a Linked Planning and Scheduling Problem from Chemical Industry

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ABSTRACT. Over the last years, there has been a growing interest in the idea of combining the two techniques of Constraint Programming and Mixed Integer Programming. The idea is appealing, because the techniques are very similar in that they both rely on the idea of branching and are principally able to solve almost the same class of problems, on the other hand the efficiency of the techniques on certain problems is in a sense complementary. A number of papers demonstrate promising ideas on basic problems. Mixed Integer Programming has been used in mid-term production planning in the chemical industry for quite some time. Because of the nature of chemical production processes, many mid-term production planning (lot-sizing) problems require the simultaneous consideration of assignment and sequencing aspects. However, there was no single technology available capable of performing this simultaneous consideration, therefore it has seldomly been done. With the industrial availability of Constraint Programming software, this requirement can now be treated adequately. We will present a realistic planning problem from the chemical industry, which has been successfully treated with a hybrid MIP/CP approach. The MIP acts as the master process, and calls a CP solver every some nodes to enforce the constraints that can not be formulated using MIP.

RÉSUMÉ. Nous présentons un problème réaliste de planification dans l’industrie chimique qui a été traité avec succès avec une approche hybride MIP/CP. La MIP est le processus maître, il appelle régulièrement un solveur CP pour assurer les contraintes qui ne peuvent pas être formulées avec la MIP.

KEYWORDS: hybrid MIP-CP algorithm, planning and scheduling, chemical industry.

MOTS-CLÉS : algorithme hybride MIP-CP, planification, industrie chimique.

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