Cell formation in group technology using constraint programming and Boolean satisfiability

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Cell formation consists in organizing a plant as a set of cells, each of them containing machines that process similar types or families of parts. The idea is to minimize the part flow among cells in order to reduce costs and increase productivity. The literature presents different approaches devoted to solve this problem, which are mainly based on mathematical programming and on evolutionary computing. Mathematical programming can guarantee a global optimal solution, however at a higher computational cost than an evolutionary algorithm, which can assure a good enough optimum in a fixed amount of time. In this paper, we model and solve this problem by using state-of-the-art constraint programming (CP) techniques and Boolean satisfiability (SAT) technology. We present different experimental results that demonstrate the efficiency of the proposed optimization models. Indeed, CP and SAT implementations are able to reach the global optima in all tested instances and in competitive runtime.

Boolean satisfiability

Constraint programming

Machine grouping

Manufacturing cells

A plants

Boolean satisfiability

Cell formation

Computational costs

Constraint programming

Evolutionary computing

Global optimal solutions

Globaloptimum

Machine grouping

Optimization models

Runtimes

Computer programming

Constraint theory

Group technology

Mathematical programming

Cellular manufacturing