Efficient Constraint Programming Approaches for routing problem : a case study for the VRP

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Abstract

Numerous routing or scheduling problems encompass a lot of constraints including due date, time windows, precedence constraints or disjunctive constraints. Exact resolution based on linear formulation or heuristic based approaches should expect difficulties in finding a simple feasible solution. Strongly constraints optimization problems To face this challenge, some approaches based on constraint programming are of great interest taking advantages of the great number of constraints to satisfy and providing one solution in short computation first and capable of investagating new best solution in the neighborhood of one initial solution. In numerous problems conversions of well-know mixed integer programming (MILP) formulation to CP, lead to poor CP performances. Well-known custom-made CP formulation are required to obtain CP formulation of interest. The generality of the CP approach and its efficiency is demonstrated to a VRP where the MILP formulation conversion lead to a 150s resolution time and the well-known custom-made CP formulation provide a resolution in 0.8s. The generic appaoch for solving combinatorial otpimization problem with a CP paradigm is based on global constraints, enumeration technics, propagating technics ... to facilitate strong reduction of domain and a proper exploration of the search tree.

Keywords: VRP, Contraint programming

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