A Note on Modelling Exact Resource Consumption in Dynamic Programming Algorithms for Solving Shortest Path Problems with Resource Constraints

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Résumé

The elementary shortest path problem with resource constraints (ESPPRC) often appears as a subproblem in column generation algorithms for solving vehicle routing problems. Although different methods have been proposed in the literature to solve the ESPPRC, this problem is often solved by dynamic programming in order to search for several columns at a time. The efficiency of these algorithms rely mainly on their ability to discard labels which cannot lead to an optimal solution as early as possible. This is done through one or several dominance rules. Efficient dominant rules have been proposed for variants of the ESPPRC in which we model minimal resource consumption. Nevertheless, some variants of vehicle routing problems in which we need to balance the routes lead us to variants of the ESPPRC in which we need to model exact resource consumption. We could find only one previous work which deals with the modelling of exact resource consumption in this context. In this presentation, we discuss how to model exact resource consumption in dynamic programming algorithms for solving the ESPPRC. We propose different ideas to improve on the only previous work we could find in the literature and validate them through experiments.

Mots-Clés: Shortest path problem with resource constraints, Vehicle routing, Column Generation, exact resource consumption

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