Studying Complexity of Decomposition in Railway Traffic Planning

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Abstract

Responsive and effective railway operations can be based on a flexible timetable concept with daily adjustments, based on the daily needs of the network such that it satisfies a set of business objectives. This motivates the need to develop solution algorithms to solve large-scale scheduling problems fast and efficiently. We develop, on an existing logic-based Benders decomposition framework, methods and algorithms to enhance the efficiency of automatic train scheduling. We study a variety of algorithmic improvements which have the goal of making the centralized and decomposed solution faster and with higher quality, and easier to handle and interpret from an industrial point of view. We also study how specific choices in geographic-based, time-based and train-based decomposition balance to a different extent the computation effort to solve decomposed subproblems, versus coordinating them towards a global solution.

Keywords

Timetabling, railway traffic, mixed-integer linear programming, Benders decomposition