
The Timetable Planning Problem for the High Speed Trains of the Chinese Railways

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Abstract

We study the Train Timetabling Problem (TTP) of the high-speed trains at the Chinese railways. In particular, we focus on the Beijing-Shanghai line, that is a double-track line with 29 stations along which more than 300 trains run every day between 06:00 and midnight. TTP calls for determining, in the planning phase, an optimal schedule for a given set of trains, while satisfying track capacity occupation constraints.

In this work, we are given on input a set of feasible timetables for the trains already planned along the line, and the main goal consists of scheduling as many additional trains as possible: for each additional train, we are given its departure time, its traveling time between each pair of stations and its set of compulsory stops with the corresponding minimum stopping times. In order to schedule the additional trains, we are allowed to change their departure times and to increase their stopping times. Moreover, we investigate the possibility of modifying the timetables of the already planned trains, even by changing their stopping patterns, i.e. we allow to add or remove some stops.

Beside the main goal, a second objective is to obtain a regular schedule, i.e. a schedule showing regularity in the train frequency and in the train stopping patterns.

To solve this problem we propose a heuristic algorithm and test it on real-world instances of the Chinese Railways.

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