## Optimal Timetables and Vehicle Schedules in Public Transportation

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## Abstract

The Transit Network Timetabling Problem (TNTP) aims to determine optimal timetables for each line in a transit network by establishing departure and arrival times at each station. The main objective in public transportation consists of providing an optimal service for passengers under fleet size constraints. Those users traveling later or in advance than their desired travel times, will suffer an scheduling cost which would be unavoidable unless vehicles performed departures continuously.

TNTP is related to the well known *p*-median problem in operations research, where the objective to be minimized is some measure of time between vehicle departures and user requests. However, costs for traveling later or before than desired times should be different so an asymmetric fitting function should be defined in order to evaluate riders disarrangements. In addition, since an inappropriate timetable could provoke a passenger deviation to another means of transportation, times windows for each traveler must be required.

This paper deals with the optimal timetable for a given number of vehicles when users differ between their desired travel times. According to different transport policies, the problem is formulated through two location-allocation models and is solved for real size instances.

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