# A robust approach for creating similar vehicle schedules in practice

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**Abstract** The vehicle scheduling problem creates vehicle blocks for a single day based on a set of daily timetabled trips. Each such block corresponds to a set of tasks that will be carried out by the same vehicle on the given day. The usual objective is to service every trip exactly once while minimizing the arising travel and operational costs. However, these might not be the only properties to consider when constructing real-world vehicle schedules. Transportation companies do not optimize their planning horizon on a day-by-day basis, but create plans for a longer period in advance. Such a planning horizon will contain days that have the same, or a similar underlying timetable: for example, the same trips have to be executed to satisfy travel demands on any workday, but some workdays (like the first day of the week, or workdays during school period) might have a small number of extra trips compared to this common set. The schedule of such days should not be developed completely independently of each other: days that have a similar underlying timetable should have similarities between their daily blocks as well, introducing regularity to the long term plans of the company. While this property is important for the companies, the problem itself is not a widely studied one; an overview of possible solution methods an a mathematical model is given in [1], while we presented modifications for two of our vehicle scheduling heuristic in [3]. In our talk, we introduce a mathematical model for the problem that utilizes robust scheduling techniques: we propose a flow model that simultaneously handles several timetable scenarios with similar underlying trips. The model develops a combined vehicle schedule considering all trips that belong to similar days, and creates separate daily vehicle schedules based on them. The quality of these

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results is measured by comparing their average deviation from a common reference schedule. The efficiency of the proposed model is presented by solutions both on real-life and randomly generated instances. The real-life input was provided by the transportation company of the city of Szeged, Hungary, while the random instances sets were created with a focus on the similarity of their timetables, and the method we apply for this is an extension of our earlier instance generating algorithm in [2].

**Keywords** Vehicles scheduling · Network flow · Robust model

## References

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