

Topic Proposal for a thesis:

Dealing with Periodicity in Public Transport Scheduling

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Background and Importance

Periodicity is an essential component in public transport scheduling, as it aids passengers in memorising schedules and thus enhances the service's accessibility. There are two dominant methods to handle this periodicity - explicit and implicit. Each has its strengths and weaknesses, with explicit methods focusing on compact, albeit complex, models and implicit methods offering less compact, yet more straightforward solutions. This project seeks to delve into the intricacies of these methods and uncover optimisations potential.

Problem description

The project aims to engage with the explicit and implicit methods of handling periodicity in public transport schedules. The purpose is to understand the trade-offs involved and derive optimisations potentials of existing implementations. Working in conjunction with SBB, the research will have practical significance and contribute to a better understanding of how to manage periodicity in public transport schedules.

Approach and Research Question

From an academic perspective, the explicit and implicit approaches to periodic scheduling have been widely discussed. However, a comprehensive comparison and potential integration of these methods are less prevalent. This project presents an exciting opportunity to bridge this gap and explore the potential middle ground that combines the strengths of both methodologies while mitigating their weaknesses.

The primary research question is:

- How can the handling of periodicity in public transport scheduling be improved by comparing and possibly combining the explicit and implicit methods?

Additional elements that the student may consider are:

- What is the potential middle ground that combines the advantages of both explicit and implicit methods while mitigating their disadvantages?
- How could the solver be equipped with periodicities to better support the various stages of schedule creation?

Industry Relevance

From SBB's perspective, understanding the best way to handle periodicity is crucial. Their scheduling is created in several stages, and there are interesting transitions, such as between peak and off-peak hours or weekdays and weekends. By understanding how to better handle these periodicities, SBB can improve their operations and make the transportation system more efficient and user-friendly.