TECHNISCHE UNIVERSITÄT DRESDEN

PROFESSUR FÜR BETRIEB VON BAHNSYSTEMEN

Fakultät Verkehrswissenschaften | Chair of Railway Operations

Thesis project

Adjusting railway services during infrastructure maintenance possessions

karte.bahn.de/region/DB_Fernverkehr

Description

To ensure the safety, reliability, and performance of railway services, Germany's railway infrastructure requires regular and extensive maintenance. Given the size and density of the network, maintenance activities (Betriebs- und Bauanweisungen) are routine. DB InfraGO coordinates over 1,500 construction sites affecting operations each week. Both long-term closures (Sperrpausen) and short-term weekend possessions frequently lead to reroutings, cancellations, or shortened services, notably during intensive phases like the Riedbahn or Rhine Valley projects.

These maintenance possessions create operational complexity and inconvenience for passengers and freight operators. Adjusting timetables and rerouting services remains a major challenge: it demands minimizing disruption while ensuring sufficient access for maintenance crews. Current planning processes are still largely manual and reactive. Although digitalization efforts, such as the Digitale Schiene Deutschland program, are progressing, there remains significant potential to improve how possessions are scheduled and how railway services are adjusted to better balance customer needs and infrastructure requirements. Additionally, multiple replacement services (e.g. bus, train) may be planned.

Assignment

This project aims to develop optimization models and algorithms that intelligently adjust railway timetables in response to maintenance closures. The goal is to provide better, more predictable services for customers during planned infrastructure works, while ensuring that maintenance needs are fully met. Focus can be on passenger and/or freight operations.
Expected research steps are:

- Literature study of existing articles
- Data preparation
- Develop a new approach for designing adjusted timetables
- Perform experiments on real life instances in Germany
- Write a report

Background

The student should have a strong background in transportation science, preferably rail operations and scheduling. A solid knowledge and/or interest in mathematical optimization, data analysis, and programming is welcome. The research topic can be suitable as research work (Studienarbeit), MSc thesis project or a diploma.

Background

Van Aken S., Bešinović, N., Goverde, R.M.P. (2017). Designing alternative railway timetables under infrastructure maintenance possessions. *Transportation Research Part B: Methodological*, 98, 224-238.

Contact

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