



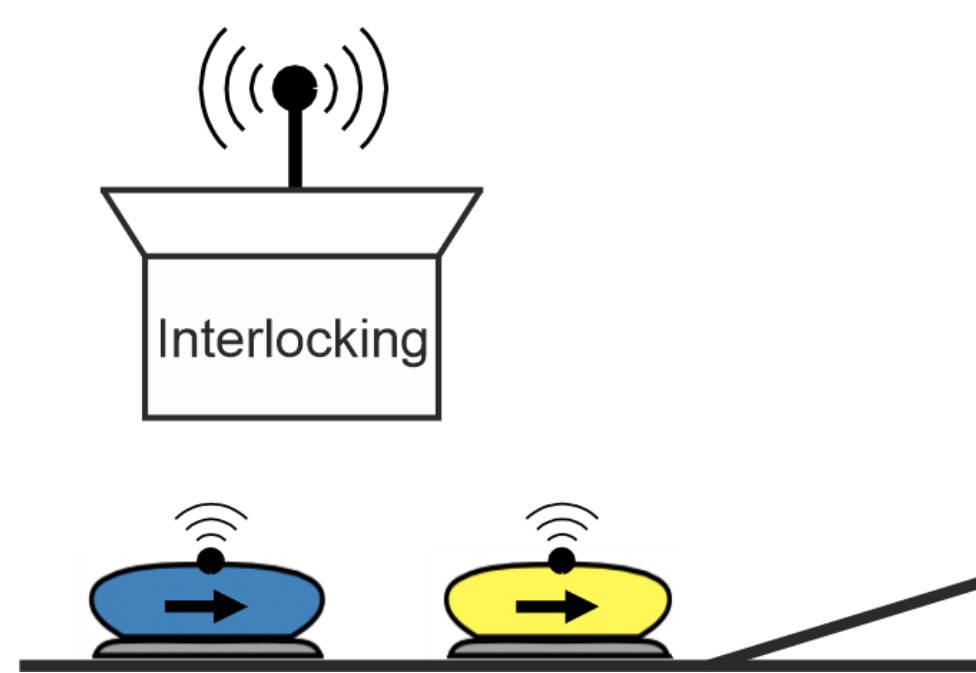
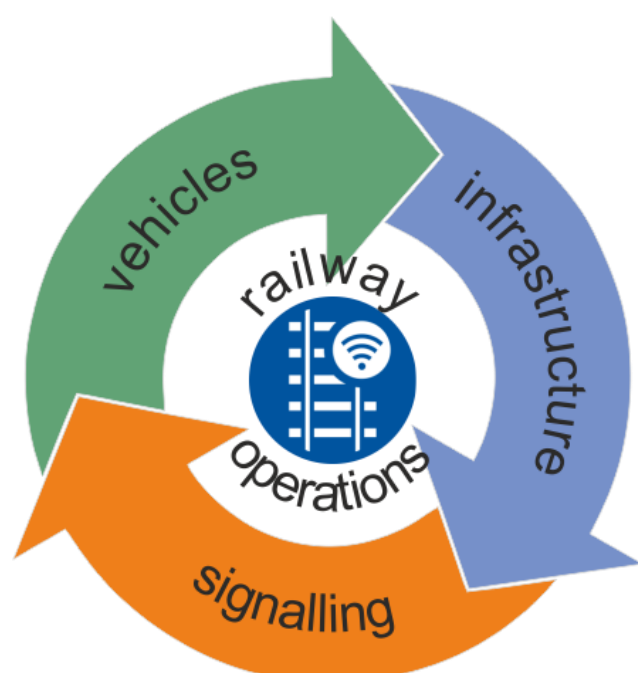
PROBLEM STATEMENT

Urbanization often leads to a **vicious cycle in rural areas** resulting in reduced availability of public rail transport or even its **discontinuation**. This shortcoming could be addressed by introducing an **on-demand rail service** with unattended small-sized vehicles. The focus on demand-responsive rail transport in regional areas can have strong **positive scaling effects**. The task is to create schedules for the vehicles which satisfy the passenger ad-hoc demand.

INTEGRATION OF UNATTENDED VEHICLES

Unattended vehicles influence railway operations

- Focus on regional lines due to limited speeds and spare capacity
- Unattended vehicles need to be integrated in Traffic Management Systems
- Allow new infrastructure and signaling concepts
- In some scenarios, unattended vehicles can coordinate operations by their own



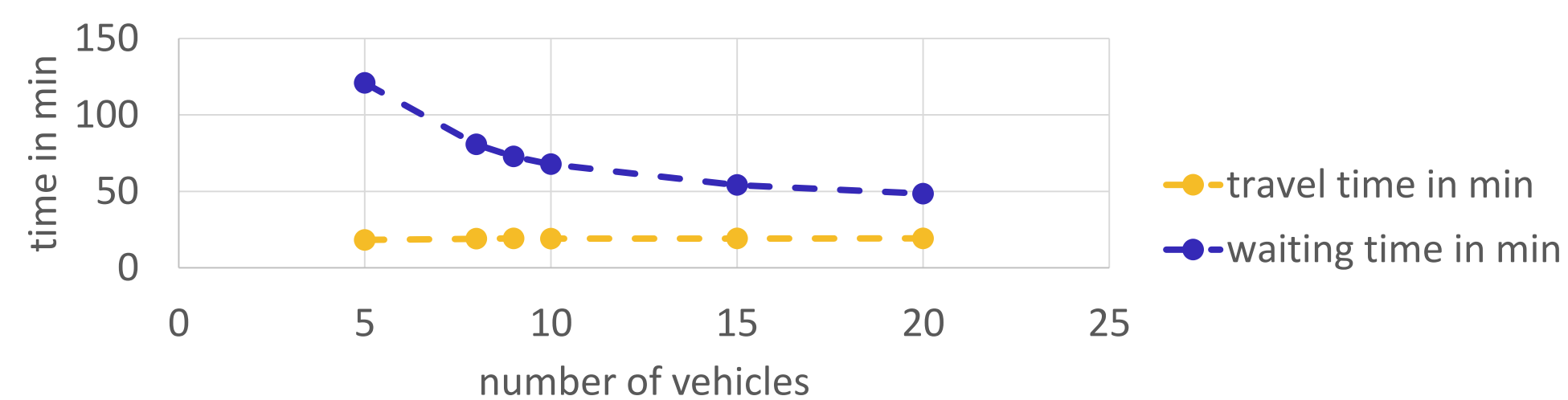
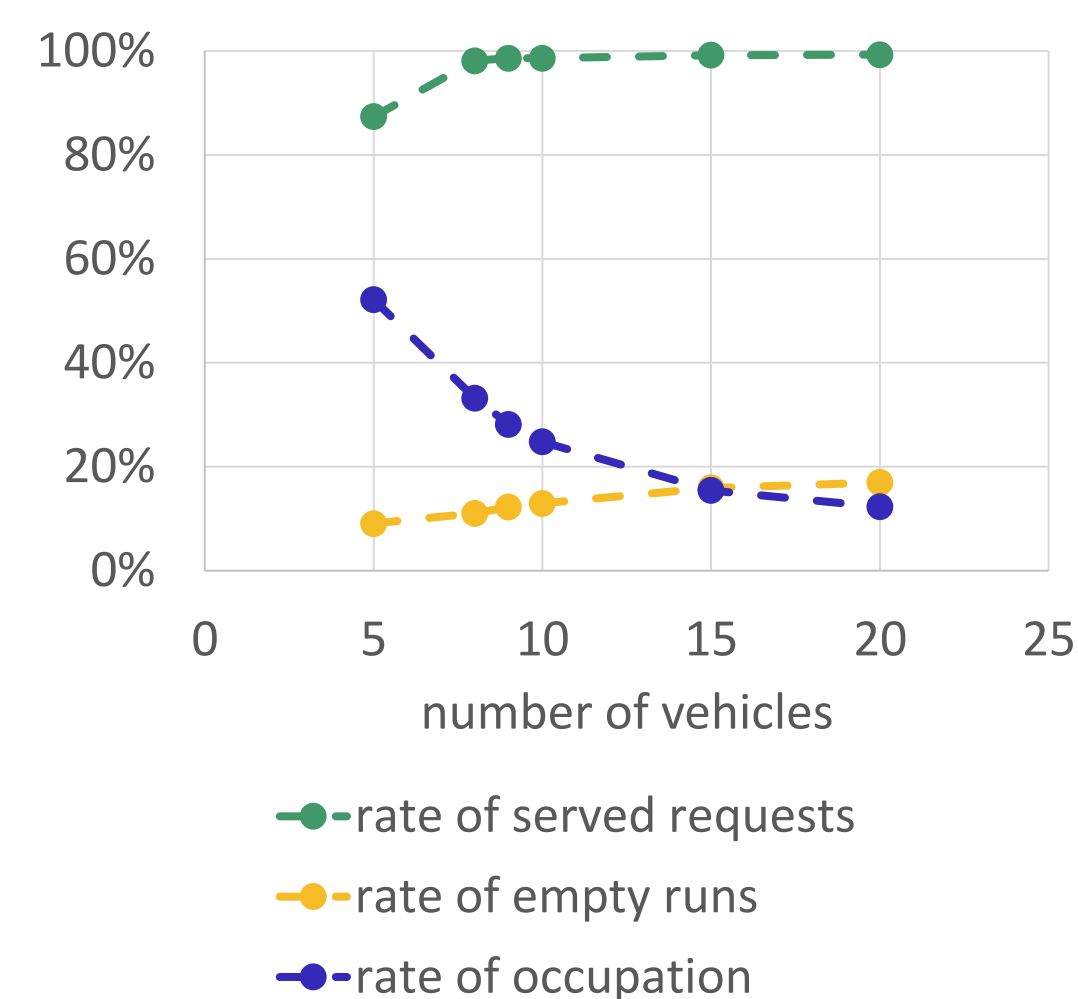
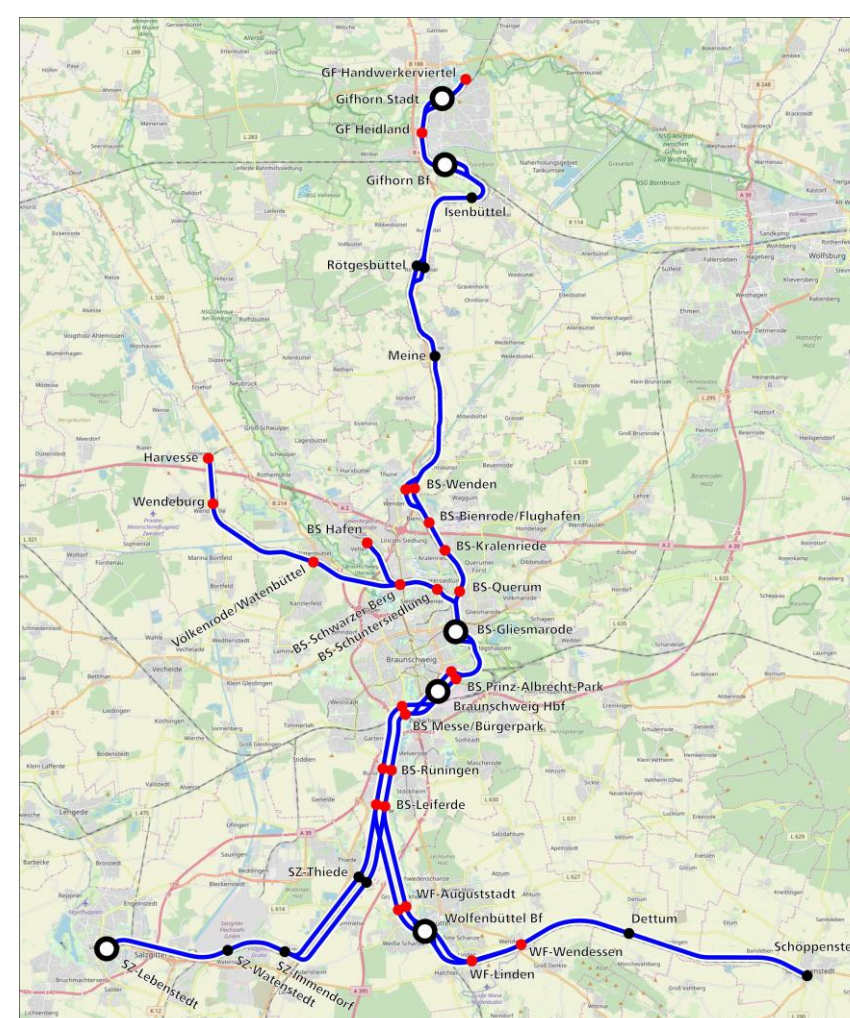
CHALLENGES

- Infrastructure and vehicle design
- Communication between vehicles
- Reliable obstacle detection
- Acceptance of unattended vehicles
- Solutions for level crossings
- Timing intermodal connections
- Energy and loading concepts
- Operations during failures
- Financing and legal framework
- ...

POSTER SESSION

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Demand-Responsive Rail Transport



OPERATIONAL IMPACT

Key results of first simulation study

- General feasibility was demonstrated
- Short travel times with direct connections
- Long waiting times from booking to departure
- Number of vehicles is a critical design-parameter
- Pendular operation for single-track sections

CONCLUSIONS

- Railway scheduling demands fulfilling several constraints
- Implementation of unattended rail vehicle services is a challenging problem
- Small railway vehicles can increase accessibility, availability and demand-responsiveness in regional areas
- Single-track and interlocking limit operational flexibility

FURTHER WORK

- Development of advanced dispatching strategies
- Implementation of distributed autonomous behavior
- Consider energetic constraints without catenary
- Proof of concept for different scenarios
- Validation and case study for several disused railway lines
- Prototyping/Technical integration