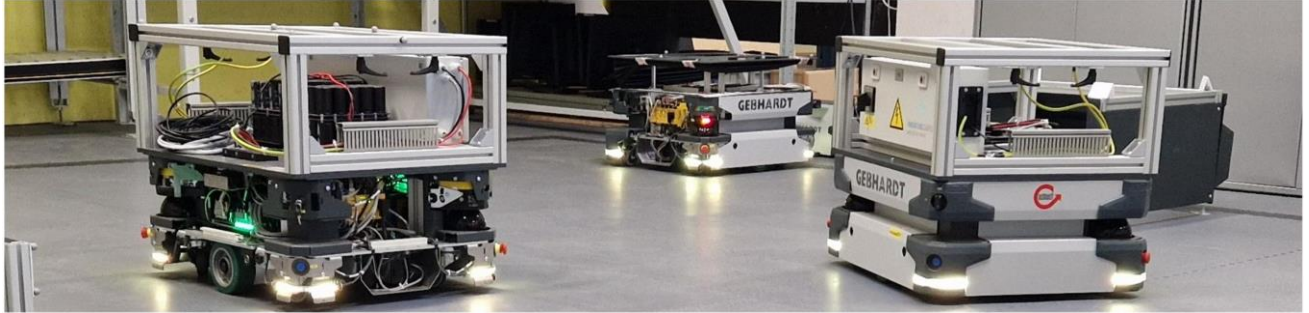


Bachelorthesis / Masterthesis

Optimizing Traffic Flow in Large Mobile Robot Fleets Using Adaptive Zones



Field: Mobile robotics is one of the fastest-growing and most dynamic areas in intralogistics. As fleet sizes rapidly increase, the challenge shifts from single-robot navigation to large-scale, cooperative fleet coordination. Efficient and adaptive management of these fleets is essential to ensure high system throughput, reliability, and productivity. At the IFL, we are at the forefront of this development, actively contributing to the industry standard VDA 5050, which defines communication between mobile robots and fleet management systems.

Problem Statement: Zone-based coordination is effective for large mobile robot fleets, but the optimal placement, size, and type of zones remain an open research question. Current systems often rely on manually defined zones, which can lead to congestion and reduced throughput. This thesis focuses on optimizing traffic flow using adaptive zone generation, initially through heuristic methods and potentially extending to learning-based approaches. Key questions include determining where zones should be placed, their appropriate granularity, and suitable types for different layouts and fleet sizes, with the potential to explore dynamic adjustment of zones during runtime to further improve efficiency and coordination.

Required Skills:

- Experience with Python or a similar programming language.
- Knowledge of pathfinding algorithms, multi-agent systems or operations research is an advantage.
- Familiarity with machine learning frameworks is a plus.
- Problem-solving mindset and an independent working style.

Benefits: Join a young, motivated team working on cutting-edge, industry-relevant research in mobile robotics. Your work will directly influence real-world projects. You'll receive close supervision with weekly feedback sessions, as well as access to workshops on scientific writing, software engineering, and more.

Research Group:

Mobile Agents and Robotic Systems

Thesis Type:

Practical, Conceptual, Simulation

Majors:

Mechanical Engineering, Mechatronics, Industrial Engineering

Start Date:

immediately

Language:

German/ English

Application:

If you are interested, please email your CV, current transcript, and a brief motivation letter outlining relevant experience.

Contact:

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