Universität St.Gallen

Task-level Collaborative Ad-hoc AGVs for Efficient Warehouse Logistics

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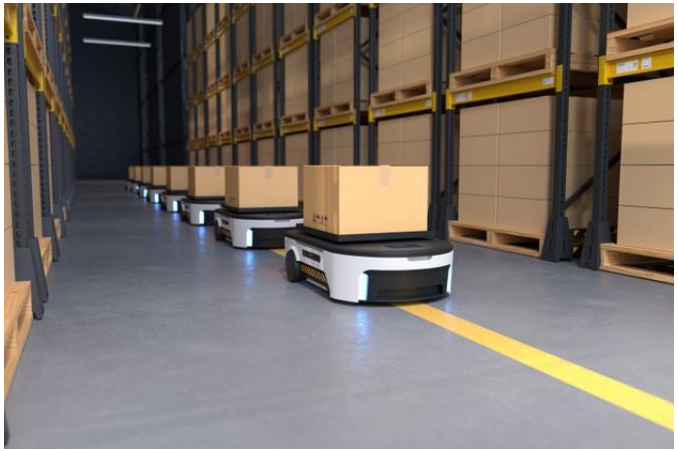
From insight to impact

Motivation

Automated Guided Vehicles



Autonomous task coordination

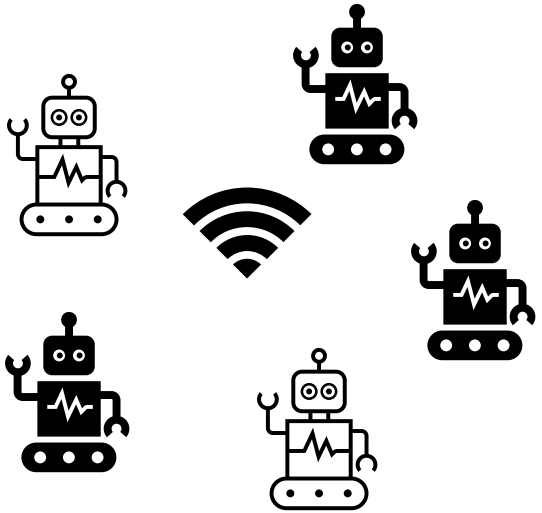


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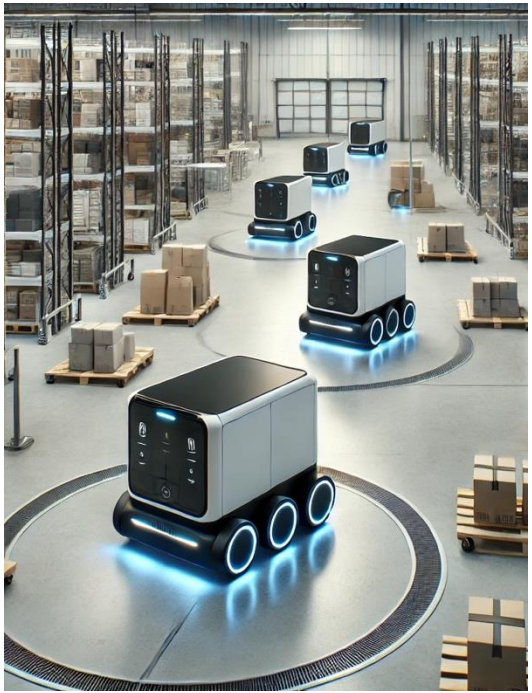
Image source:
https://sentralog.com/how-automated-guided-vehicles-contribute-in-industry

Related work

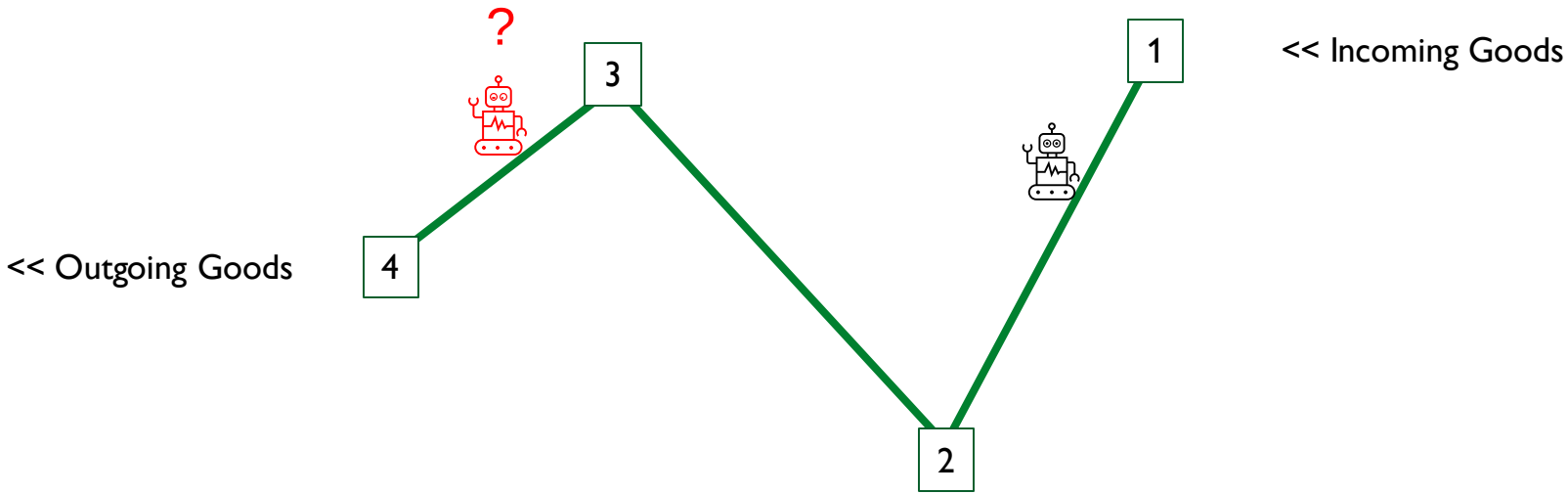
	Task Assignment	Collaboration Efforts
MARTCO	Centralized with priority based queuing	Conflict resolution, path optimization
Multi Agend RL	Centralized scheduling based on requests	Path planning
ARC5	Centralized Servus Manager	Swarm intelligence
Exotec / Galaxus	Centralized with priority based queuing	Collision avoidance, path adaptation
Frauenfelder	Semi-distributed scheduling by coordinators	Collaborative task sharing



Source:
Frauenfelder, T. (2024). Task-level Collaboration between Automated Guided Vehicles (AGV) for Efficient Warehouse Logistics. 11-12
Exotec. (2024, June 24). Lagerroboter Skypod® entdecken. https://www.exotec.com/de/system/lagerroboter/

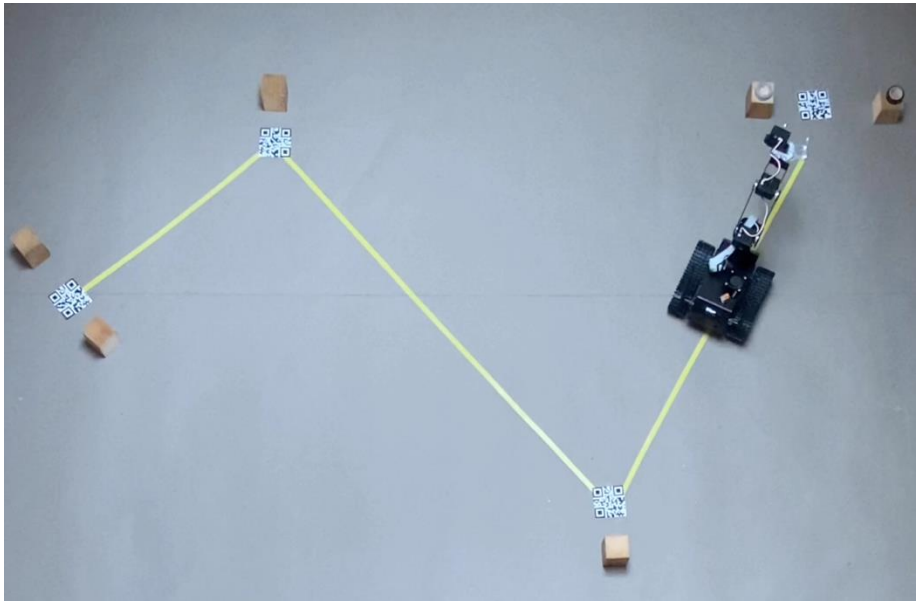
Designing our Warehouse (I/II)

Example task
Pick up two packages at waypoint 1 and deliver them to waypoint 4

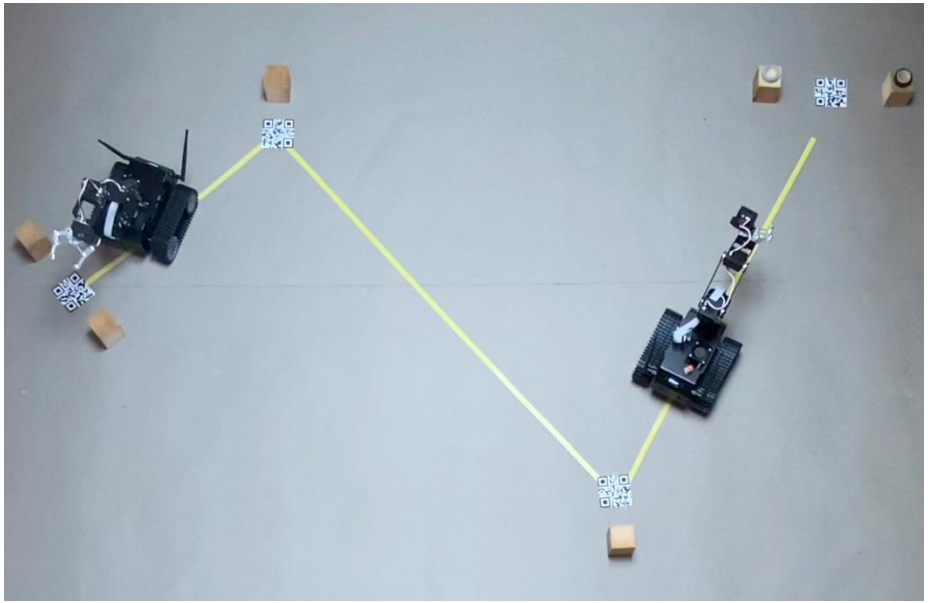


Designing our Warehouse (II/II)

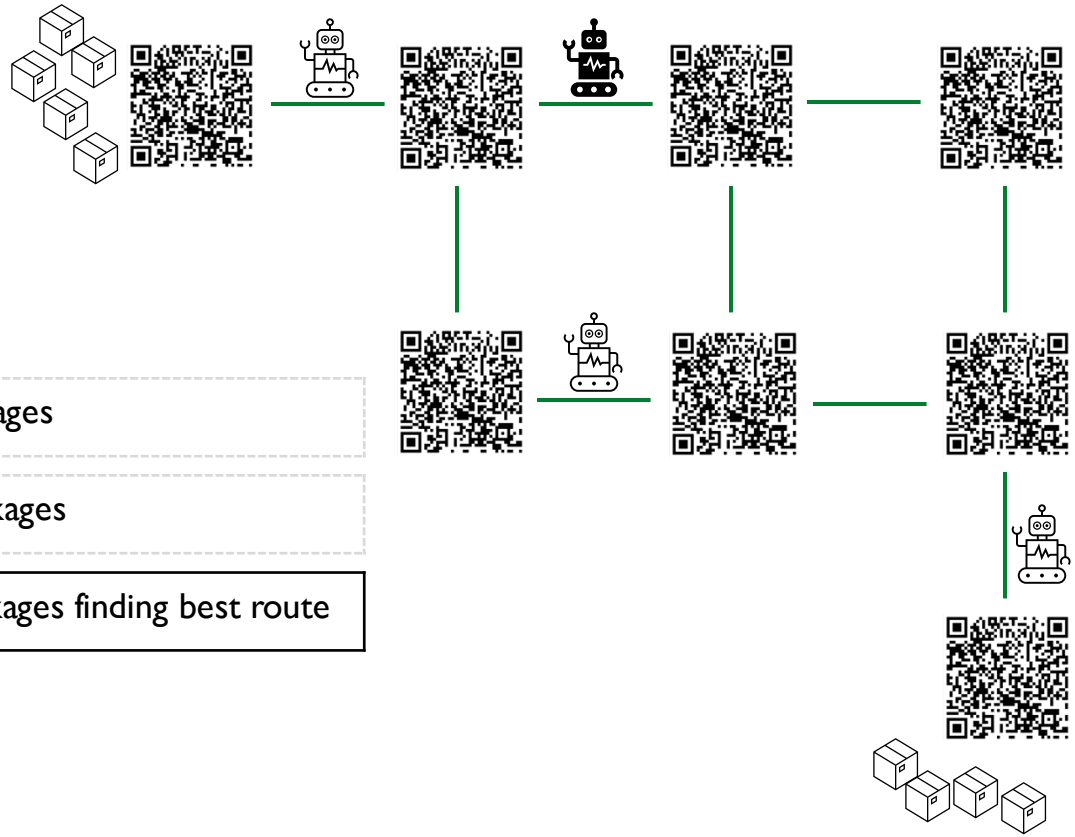
One Robot on its own



Two Robots working together



Design for Premium



One Robot	1 robot delivering packages
Two Robots	2 robots delivering packages
Premium	n robots delivering packages finding best route

What are our next steps?

Baseline

- Robot is able to follow the edges and can identify vertices
- Entity “Task Master“ can assign tasks to robot

Milestone 2

- Robots share their current edge and preferred pathway
- Tasks can be subdivided and be assigned to other robots or TM

Milestone 3

- Explore more complex and connected pathways
- Introduce more robots into the system

Q & A

Questions?

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