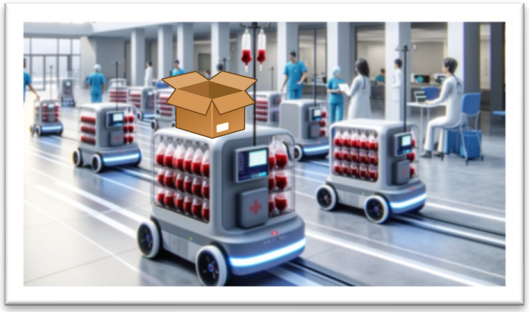
Intelligent Hospital Logistics

Master Team Project FSS 2024
Institute for Enterprise Systems (InES)

Introduction to MediCar 4.0

The **Next Generation** of **Hospital Logistics**

Multiple vehicles
transporting **intelligent boxes**
between **stations**



Unexpected Incidents
(robot failures, collapsed patients, …)

Dynamic Environment
(crowded streets, temporary events, …)

Many Different Goods
(from clothes to blood samples)

Different Transportation Requirements
(vibration, temperature, …)

Medicar 4.0

Research Questions

- Can Large Language Models **simulate** the **impact** of **incidents** on routing graphs?
- Can Large Language Models be used for **solving routing problems** across heterogeneous goods?

General Steps

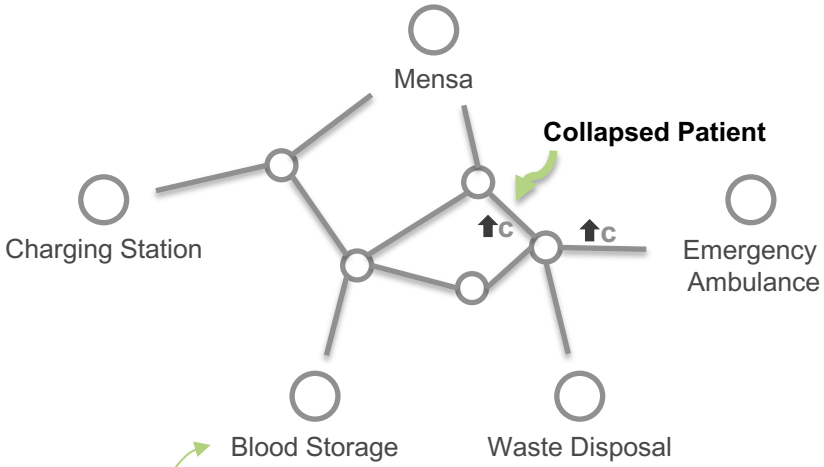
1. Simulation Environment
2. Routing Optimization
   - A*-Baseline
   - Large Language Models
3. Evaluation
4. Next Steps …

1 Simulation Environment

The University Hospital in Freiburg

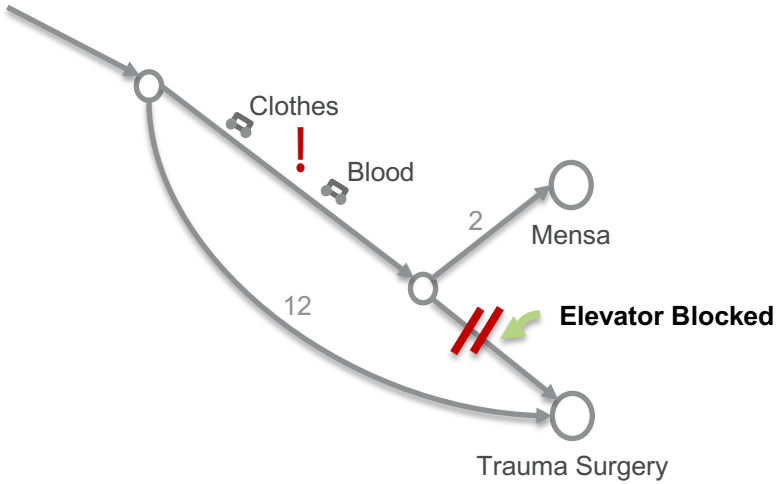
Required Simulation Environments

Replication of the University Hospital



Heuristics regularly start transports …

Synthetic Examples (e.g. Deadlock)

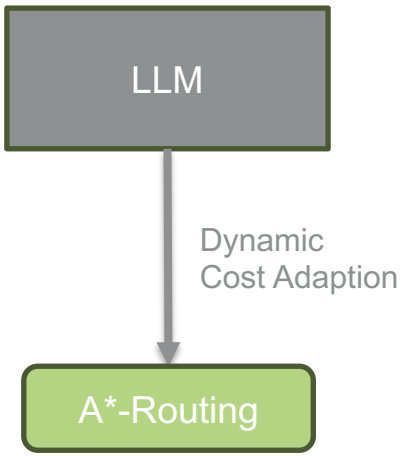


Discuss your own ideas

2 Routing Optimization

Can we combine the A*-Algorithm and Large Language Models?

Example Approach: Approximate Heuristic of the A*-Algorithm with Large Language Models



Example Scenario
Emergency due to traffic accident

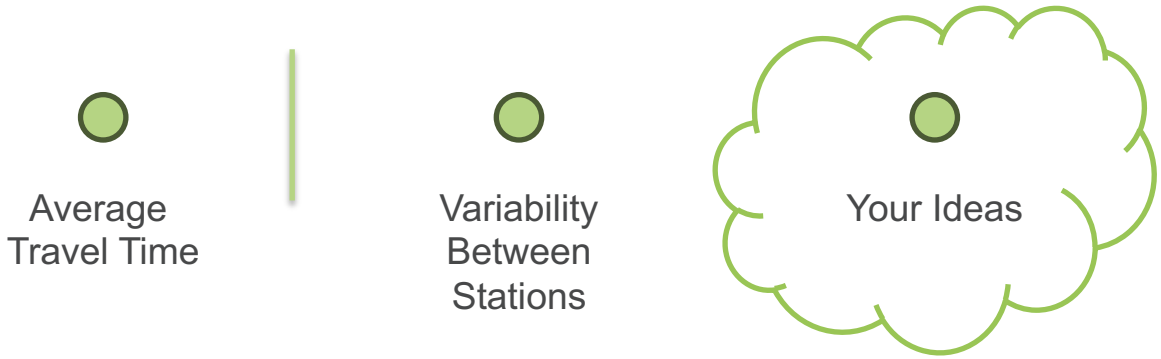
- Chaos surrounding ambulance and transfusion blood that may be needed soon
- Adjust costs to keep the path between the ambulance and blood storage clean

Test Methods to Improve the Approach

Instruction Finetuning, Memory, ReAct, …

3 Evaluation

Can we combine the A*-Algorithm and Large Language Models?



4 Next Steps

Expand The Framework

- Visualization
- Larger Routing Graphs
- More Transportation Goods
- Reinforcement Learning Routing
- Your Ideas

Contact Details

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About Your First Steps …

1. Setup Technical Infrastructure
2. Plan Software Architecture
3. Extract Coordinates From OpenStreetMap
4. Implement Functionality
5. Setup Custom MQTT-Broker

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Technical Infrastructure

Tasks for the first week

- Decide on Project Management Tool (e.g. Trello)
- Communication Infrastructure (WhatsApp, Slack, …)
- Frequency and Structure of Internal Meetings (GoogleDocs)
- Code Storage (GitHub – **Invite your supervisor (timg339)!**)
- Make yourself comfortable with the frameworks

Tool Suggestions

git

python™

NetworkX
Network Analysis in Python

MQTT

LangChain

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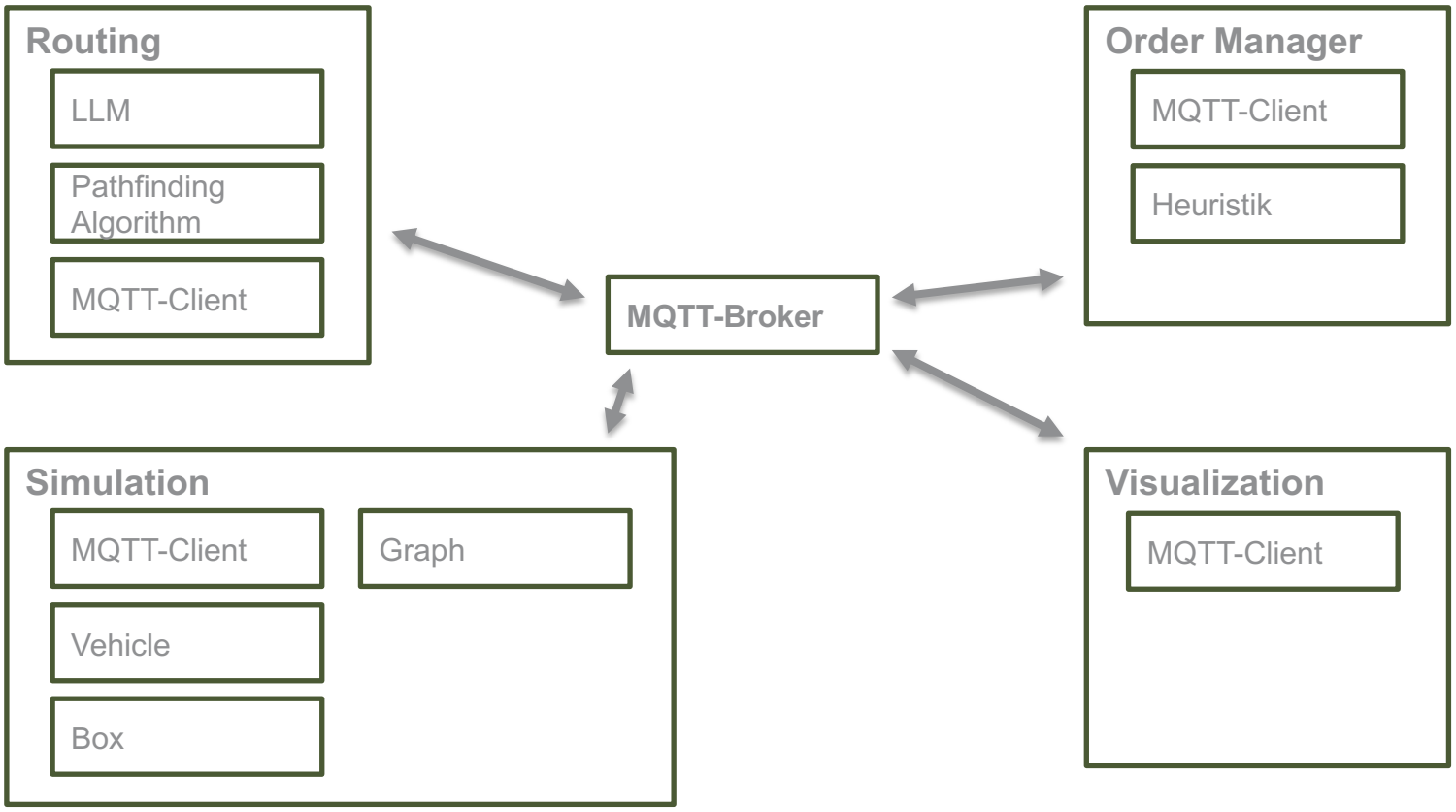
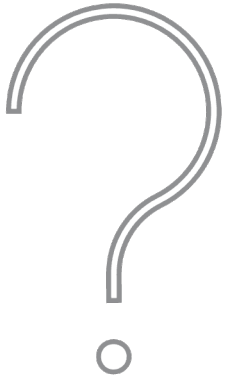
Software Architecture





Any Questions?