Chair of Transportation Systems Engineering
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Using MATSim-UAM Extension to Simulate the Charging Behavior of UAM Vehicles for Further Scenarios

1 Introduction

Urban Air Mobility (UAM) is emerging as a revolutionary component in modern transportation, promising to redefine urban transit through aerial vehicles. Key to this evolution is the simulation and analysis of UAM operations. The MATSim (Multi-Agent Transport Simulation) framework, augmented with a UAM extension, plays a pivotal role in modeling these complex systems. This research focuses on expanding the capabilities of the MATSim-UAM extension, particularly in simulating and analyzing UAM vehicle charging behaviors.

2 Research Gap

While the existing MATSim UAM extension efficiently simulates the changing behaviors of UAM vehicles, it falls short in providing tools for the detailed analysis and visualization of charging behaviors. These behaviors, recorded in the event file, lack dedicated scripts for generating standard MATSim output files, crucial for in-depth visualization and analysis. This study aims to bridge this gap by developing such scripts.

3 Objective

The primary objective of this research is to develop scripts capable of generating MATSim standard output files. These files will facilitate the visualization and further analysis of UAM vehicle charging behaviors based on the data recorded in the event file. This development will enable comprehensive insights into charging patterns, efficiency, and potential bottlenecks.

4 Methodology

1. Analyzing the current structure of MATSim UAM extension's event files to understand the data format and content.
2. Designing and developing scripts using appropriate programming languages (e.g., Python, Java) that can parse these event files and generate standard MATSim output files.
3. Integrating these scripts into the existing MATSim framework to ensure seamless operation and compatibility.
4. Testing the scripts with various UAM scenarios to validate their functionality and reliability.

5 Expected Outcomes

1. A set of robust scripts for converting UAM vehicle charging data into visual and analyzable formats.
2. Enhanced capabilities in MATSim for UAM scenario analysis, leading to more effective planning and operation strategies.
3. A foundation for future research and development in UAM simulation and analysis.

6 Significance

This research is crucial for the advancement of UAM modeling. By enabling detailed analysis and visualization of charging behaviors, it will contribute significantly to optimizing UAM operations, aiding in addressing challenges such as charging station placement, vehicle scheduling, and energy management.

7 Conclusion

This research is set to make a significant contribution to UAM simulation and analysis. By developing tools for better understanding and optimizing UAM vehicle charging behaviors, it lays the groundwork for more efficient and sustainable urban air transport systems.

8 Skills Required

- Fluency in English or German.
- Ability to work independently.
- Strong knowledge of traffic simulation.
- Previous experience with Agent-based simulation (e.g., MATSim).
- Knowledge of the scripting programming language python.

9 Relevant Work

- Rothfeld, R. L., Balac, M., Ploetner, K. O., & Antoniou, C. (2018). Agent-based Simulation of Urban Air Mobility. 2018 Modeling and Simulation Technologies Conference, 1 –10.
- For additional information regarding the “AMI-AirShuttle” research project, please visit the following link: AMI-AirShuttle

10 Starting Date

As soon as possible

11 How to Apply

If you are interested, please email your resume and start date to Hao Wu (wu.hao@tum.de).