National Aeronautics and Space Administration

Modeling Existing Urban Air Mobility Operations for Transportation Network Congestion

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Synthetic Population

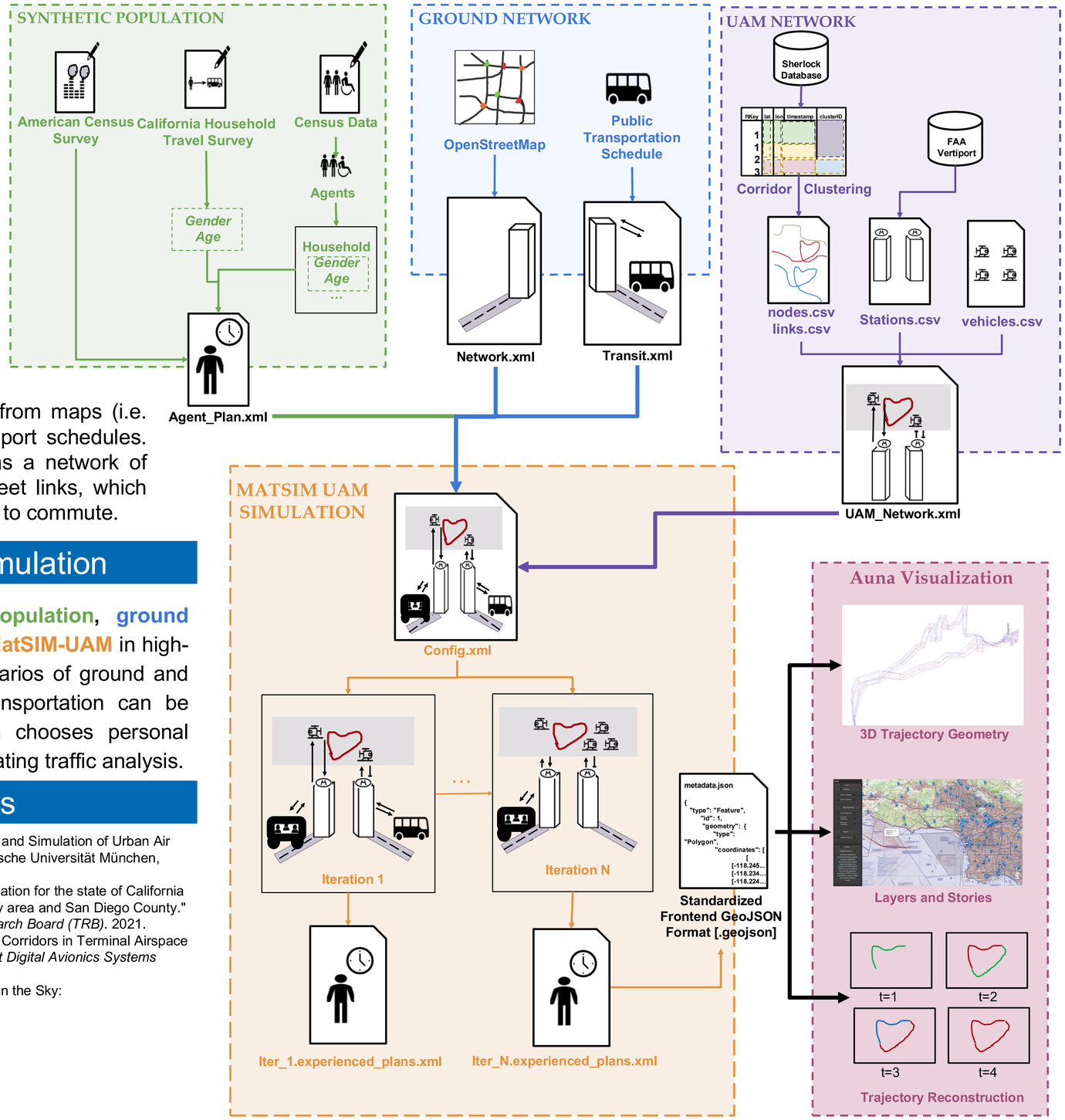
A **synthetic population** is derived from census and travel survey data. The data is processed to represent an approximation of the real world in respect to where people live, the modes of transportation available for commute and the destination of the commute (e.g. home, work, school). This is represented as the agent plan.

Ground Network

The **ground network** is derived from maps (i.e. roads, buildings) and public transport schedules. This information is represented as a network of street intersection nodes, and street links, which the **synthetic population** can use to commute.

MatSIM-UAM Simulation

By combining the **synthetic population**, **ground network**, and **UAM network**, in **MatSIM-UAM** in high-traffic urban areas, different scenarios of ground and urban air mobility modes of transportation can be simulated, where the population chooses personal best route on each iteration, facilitating traffic analysis.



UAM Network

The **UAM network** is derived from existing urban air mobility traffic (e.g. air taxis, tourism). Utilizing trajectory clustering methods to identify “highways in the sky”, we construct a network of recurring flight path links, and vertiport nodes. To supplement the location of existing vertiports, FAA vertiport metadata is used to add existing ground stations (serving similar purpose to bus stops for air taxi mobility).

Visualization

Auna Visualization contains a suite of tools to better understand the various parts of the simulation pipeline. The 3D Trajectory Geometry utilizes both actual and simulated air traffic to derive an interactive reconstruction of the **UAM network** corridors.

Auna’s layers and stories allow the overlay of additional metadata such as helicharts, which contain recommended helicopter air traffic route in congested areas, which can then be compared to chosen simulation trajectories.

The trajectory reconstruction can be used to inspect and replay a given agent’s chosen route in a specific iteration of the simulation.

References

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4. Identifying, Simulating and Visualizing Highways in the Sky: https://ntrs.nasa.gov/citations/20250005662

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Acknowledgement

System-Wide Safety

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