

Robo-Taxi Service Design, Modeling and Simulation

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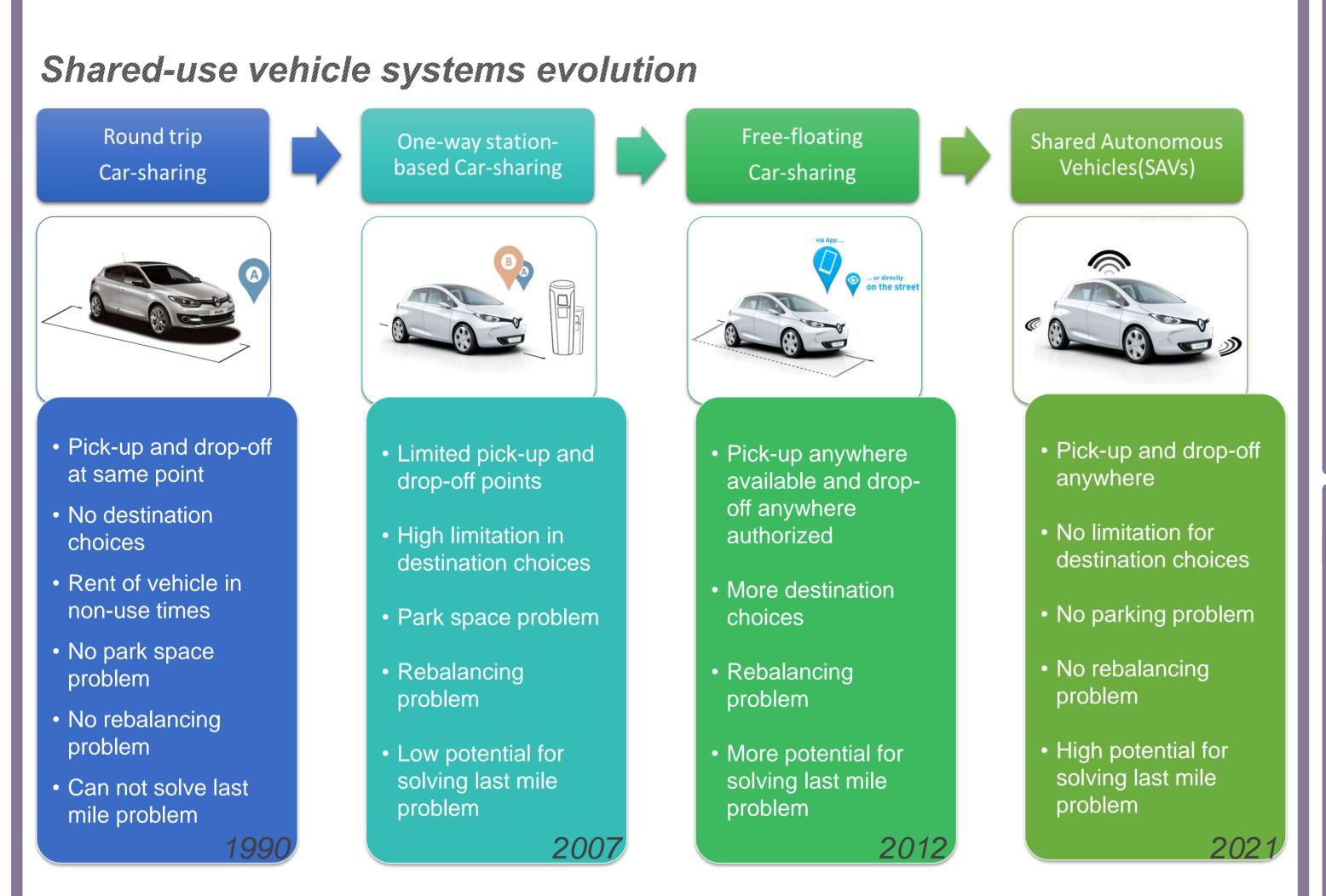
Robo-Taxi Service Design, Modeling and Simulation

Context

Bike-sharing Car-sharing Ride-sharing Scooter-sharing Ride-hailing

SHARED-USE VEHICLE SYSTEMS

shifting the private mobility from ownership to service use



CAR AUTOMOBIL SHARING















- Obviating the need for continuing the rental while at their destination
- Not worrying about whether a shared vehicle will be available when the traveler is ready to departing.
- Anticipate future demand and relocate in advance to better match vehicle supply and travel demand.

Objectives

Two major research axes:

- ► Develop a design methodology for Robot Taxis systems
- ► Conduct sensitivity analysis by using multi-modal traffic simulation environment

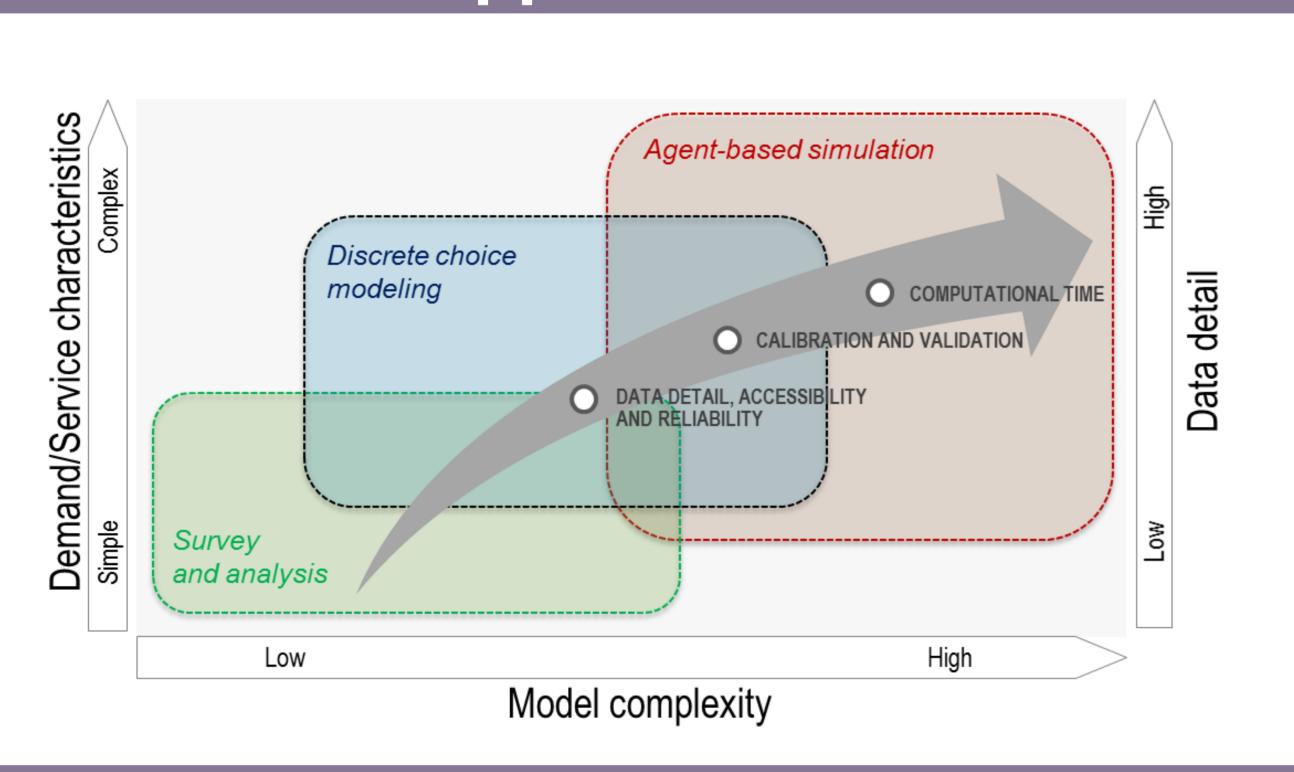
Current studies

- ♦ Predicting the usefulness of autonomous vehicles
- Estimating the number of shared autonomous vehicles needed to serve an existing demand

Expected results

- ♦ How the new travel mode would interact with existing travel options?
- ♦ How customer preferences influence the mode choice?

Approaches



Challenges

DATA DETAIL Travel should be modeled at the individual level with explicit modeling of the modal choice. It requires individual socio-demographic data.

DATA RELIABILITY

These systems are not in operation yet so a stated preferences (SP) survey would be needed. It could be costly and not necessarily result in reliable and complete model

MACROSCOPIC MODELING WITH MICROSCOPIC DETAILS

Model should be sensitive to short-distance trips so extremely fine-grained spatial information at the parcel level is needed

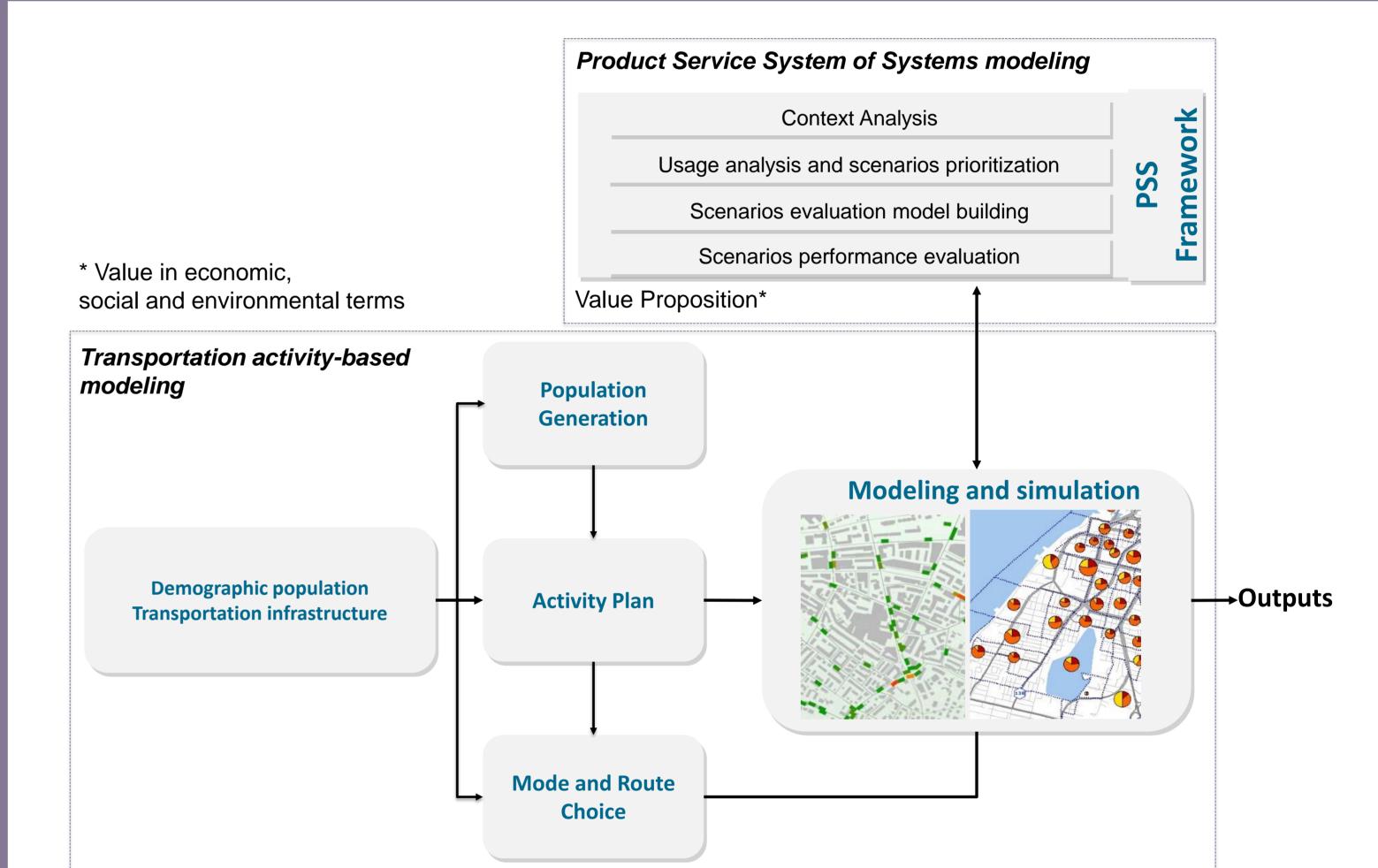
HIGH COMPUTATIONAL TIME

Model computes probabilities for a large number of alternatives at the individual level. Simulation procedures for real size networks would result in very long computation times

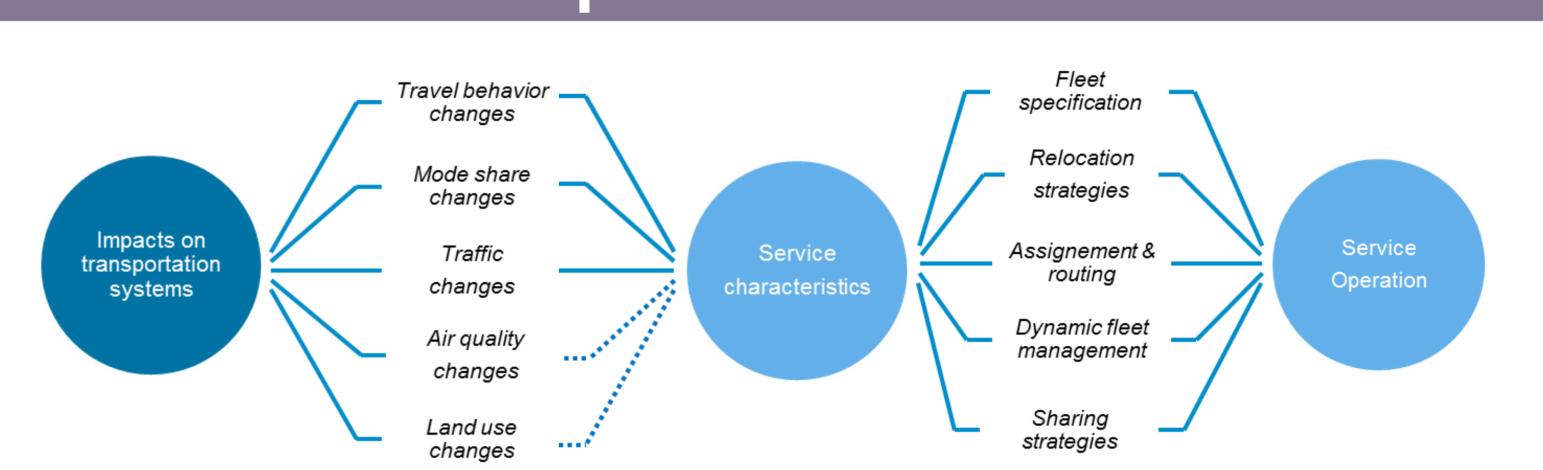
CALIBRATION AND VALIDATION

For SAVs services there are no real data at hands. It would be difficult to validate if the model run correctly or not

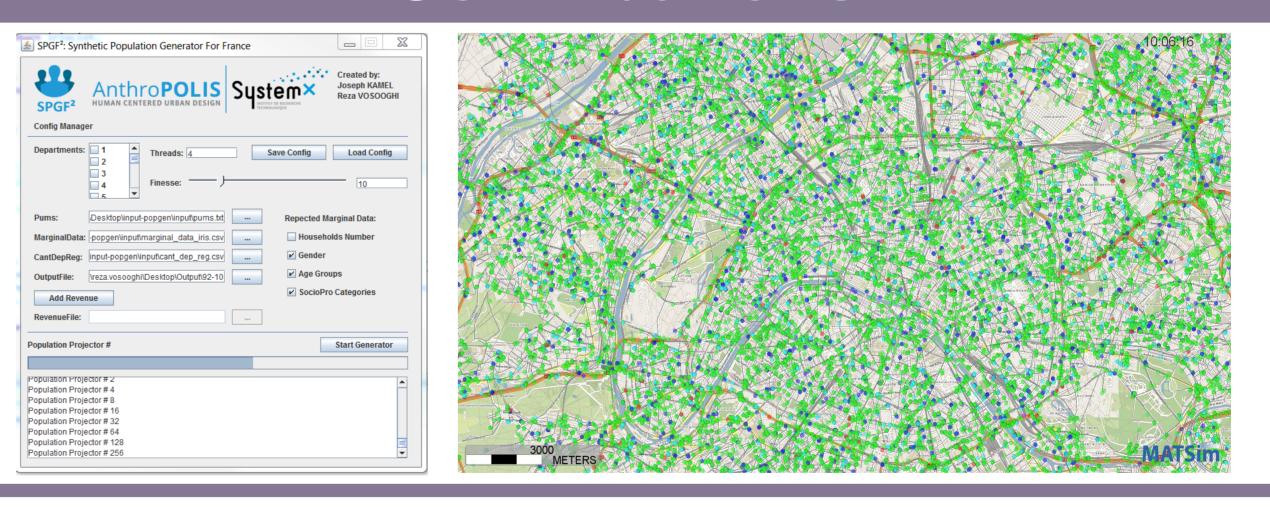
Design and Modeling Framework



Expected Results



Contributions



Bibliography

- M. Barth, & S. Shaheen, "Shared-Use Vehicle Systems: A Framework for Classifying Carsharing, Station Cars, and Combined Approaches," in Transportation Research Record: Journal of the Transportation Research Board, No. 1791, pp. 105-112.
- R. Vosooghi, J. Puchinger, M. Jankovic, and G. Sirin, "A Critical Analysis of Travel Demand Estimation for New One-Way Carsharing Systems," in 2017 IEEE 20th International Conference on Intelligent Transportation Systems (ITSC2017), pp. 193–199.
- J. Kamel, R. Vosooghi, J. Puchinger, F. Ksontini, G. Sirin, "Exploring the Impact of User Preferences on Autonomous Vehicle Modal Share: A Multi-Agent Simulation Approach 21st EURO Working Group on Transportation Meeting (EWGT2018).





