Preferred citation style for this presentation

Hörl, S. and A. Froemelt (2017) Future scenarios of land-based mobility including autonomous vehicles
Future scenarios of land-based mobility including autonomous vehicles

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ETH Zürich

30 August 2017
Traffic Simulation

MATSim

Home
Leave 7:00

Walk
From A to B

Work
Arrive 8:00
Leave 18:00

Walk
From B to A

Home
Arrive 19:00

Mobsim
Simulate one day

Scoring
Utility functions

Replaning / Selection

Hörl (2016)
MATSim Visualization

Background Map: OpenStreetMap

Visualization: Senozon VIA

Moritz Hohenfellner
2017
Autonomous Vehicles

Access to Mobility

Effective Capacities

Customer Prices

vs.

Individualization

VKT Increase

Travel Demand

Net Effect?
Future of public transport?
Autonomous Vehicles

- Access to Mobility
- Effective Capacities
- Customer Prices

- Individualization
- VKT Increase
- Travel Demand

Constraints?
Autonomous Vehicles

Meyer et. al, 2017
Autonomous Vehicles in La Défense

Background Map: OpenStreetMap
Scenario: Hörl (2017)
MATSim and LCA

- Impact Simulation
- Policy Simulation

- Extensions
  - Autonomous Vehicles
  - Electric Vehicles
  - Parking Search
  - Active Mobility
  - CO2 & Noise Emissions

www.matsim.org
Coupling MATSim with LCA

- MATSim is a powerful framework to study traffic systems and future mobility scenarios
  \[\text{\bf BUT}:\] What are the \textbf{environmental implications} of new traffic policies?

- Linking MATSim with the LCA-framework could support policy makers in deriving \textbf{effective strategies to reduce environmental impacts} from mobility

\textbf{Goal} of this presentation part:
\textbf{Outlook on the coupling of MATSim with LCA}
Coupling MATSim with LCA

Previous work
- Saner et al. 2013: case study Wattwil (CH)
- Froemelt In Hirschberg (ed.) 2016 (THELMA-report): case study Zernez (CH)
- Froemelt in the scope of SCCER Mobility: current situation in Switzerland
- Cucurachi et al. (to be submitted): Noise footprints

→ No LCA-MATSim-study on autonomous vehicles
Coupling MATSim with LCA

MAS Mobility (ETH): student exercise

Goal of the exercise:

Development and assessment of different scenarios for the introduction of autonomous vehicles (AV) in Sioux Falls (US)

Model parameters which can be adjusted:

- No. of AV-operators
- No. of vehicles per AV-operator
- Mode of operation per AV-operator (taxis vs. pooling/shared taxis)
- Price per kilometer
- Car fleet composition of each AV-operator
Coupling MATSim with LCA

MATSim-Simulations

Mobility Demand per Agent

Environmental Impacts per Agent

Environmental Impacts of Scenario

Aggregating all agents

ecoinvent

Car fleet

Environmental Impacts per Agent
Coupling MATSim with LCA

MAS Mobility (ETH): student exercise

Some preliminary conclusions

• **Fleet composition** of AV-operators is essential for environmental performance

• In the case of electric AVs: **electricity mix** is key!

• **Substitution of car trips** by AVs depends strongly on **price** (and AV-availability)
Coupling MATSim with LCA

Outlook

• Improving and fine-tuning the coupling of MATSim with the LCA-framework
• Thorough investigation and evaluation of AV-scenarios

→ This will (hopefully) deliver important insights to support policy makers in finding effective strategies to lower environmental impacts induced by mobility
Thank you for your attention - Questions?

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References