

Construction of a Simulation of On-Demand Mobility Concepts in SUMO

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Knowledge for Tomorrow



On-Demand Mobility and Bundling of Matching Requests



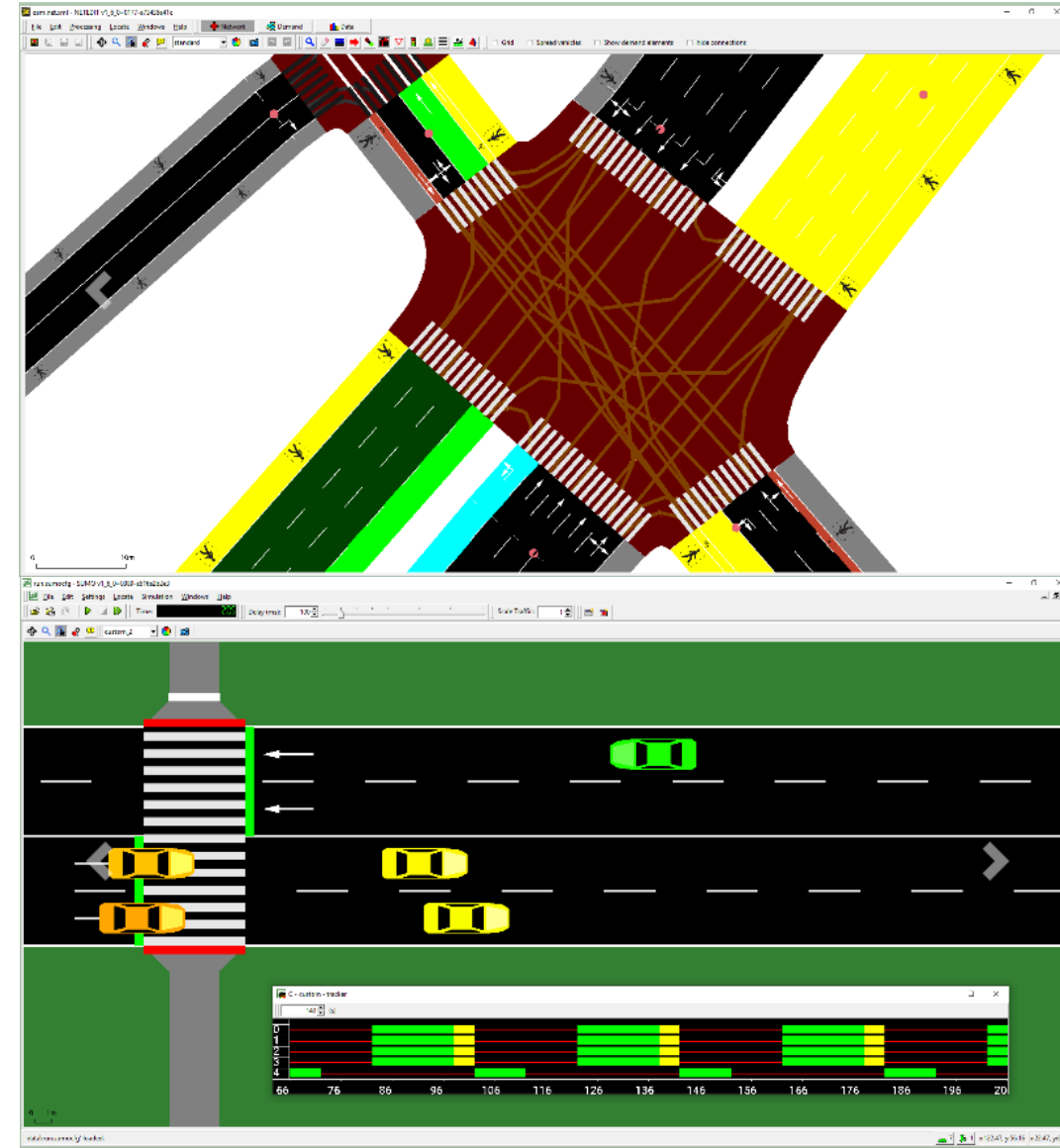
Simulation of Urban Mobility (Eclipse SUMO)

SUMO is a free and open microscopic multi-modal traffic simulation package designed to handle large networks.



SUMO allows modelling of intermodal traffic systems including road vehicles, public transport and pedestrians.

→ route finding, visualization, effects on traffic, emission calculation...

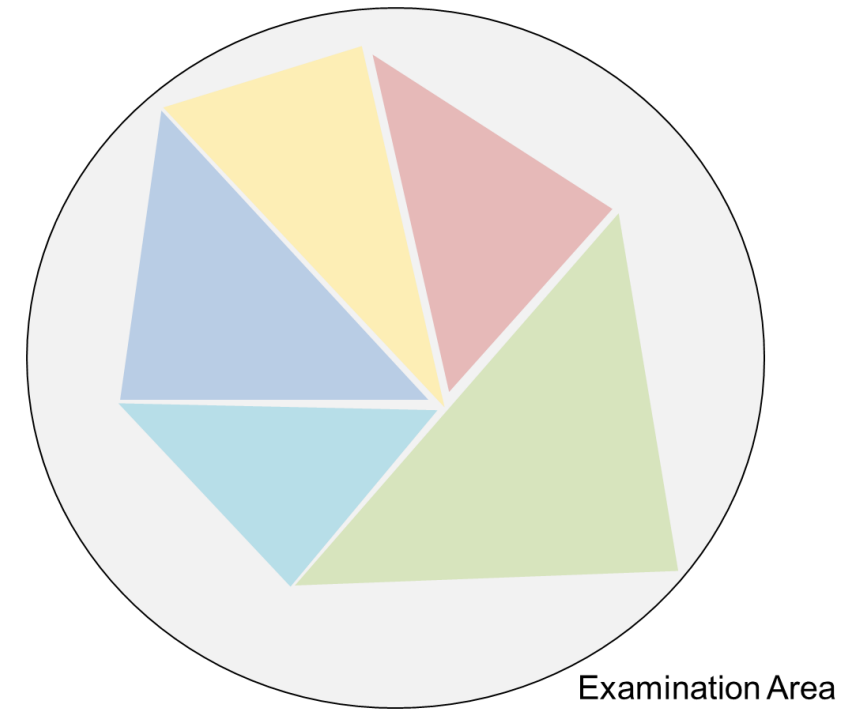


See also: <https://www.eclipse.org/sumo/>



Example of the Assignment of Demand in SUMO NETEDIT

- **Definition of Traffic Assignment Zones (TAZ):** A TAZ defines the area where participants depart and does typically contain several network edges.
- **Zone-to-Zone flow definition:** Definition of the number of OD-flows, that means trips between each zone of origin and a zone of destination. OD-flows are defined for different time intervals of the day and/or for different transport modes.
- **Trip generation:** Each OD-flow is disaggregated into a discrete number of individual trips, creating an OD-matrix.
- **Routing:** A route is computed for each individual trip, connecting the edge within the zone of origin with the edge within the zone of destination.



See also:

https://sumo.dlr.de/docs/Definition_of_Vehicles,_Vehicle_Types,_and_Routes.html#traffic_assignment_zones_taz



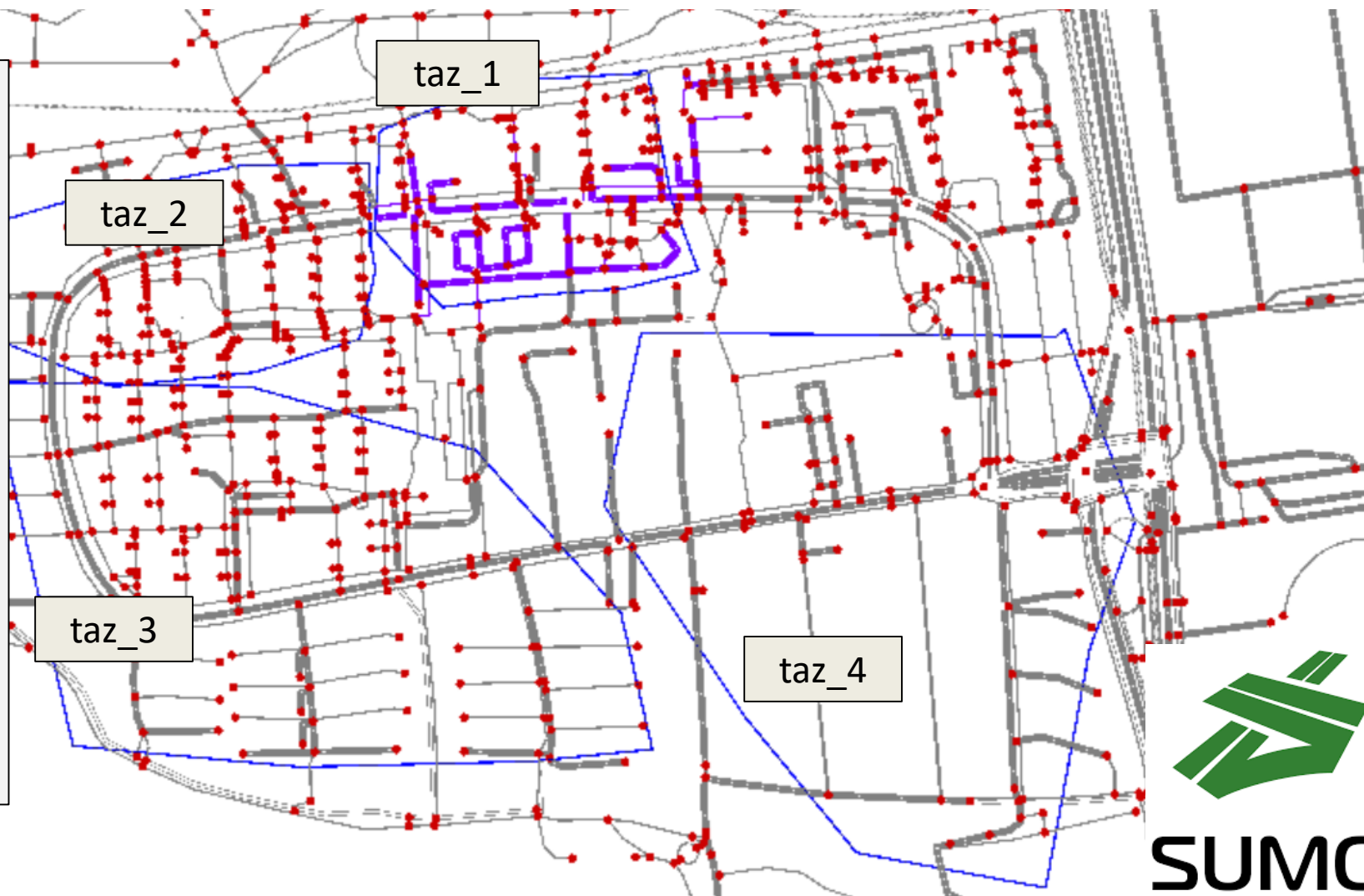
Traffic Assignment Zones (TAZ) in SUMO Netedit

Vehicles can depart and arrive at traffic assignment zones (TAZ). This allows the departure and arrival edges to be selected from a predefined list of edges.

The figure shows an examination area with defined Traffic Assignment Zones (TAZ) in SUMO Netedit.

Four TAZ are defined (blue).

An example for defined stop-lanes is shown in taz_1 (purple).

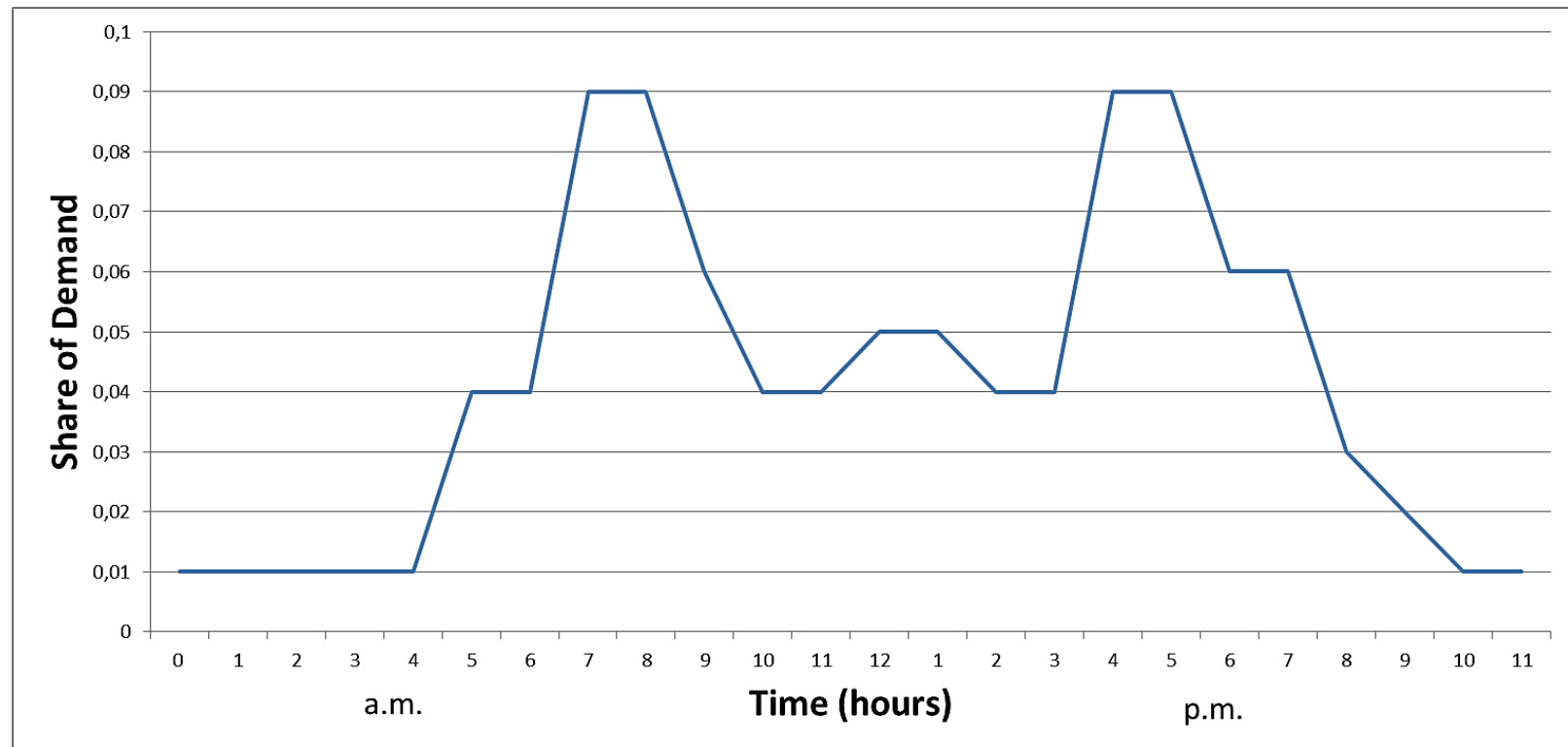


Input: Demand/ Traffic load

	a.m.												p.m.											
Time (hour)	0	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11
Share	0,01	0,01	0,01	0,01	0,01	0,04	0,04	0,09	0,09	0,06	0,04	0,04	0,05	0,05	0,04	0,04	0,09	0,09	0,06	0,06	0,03	0,02	0,01	0,01

Information about the traffic volume in the examination area is required and can be converted to an hourly demand by SUMO.

The figure shows an example of a generated 24 hour traffic load curve.



Input: Demand/ Traffic load

```
od2trips.exe -n osm_taz.add.xml -d od-matrix.txt --persontrips
true -s 1 --timeline.day-in-hours -timeline
0.1,0.1,0.1,0.1,0.1,0.4,0.4,0.9,0.9,0.6,0.4,0.4,0.5,0.5,0.4,0.4,
0.9,0.9,0.6,0.6,0.3,0.2,0.1,0.1 -o person.trips.xml --verbose -c
persons.odconfig
```

```
* From-Time To-Time
0.00 24.00
```

taz_1	taz_1	130.00
taz_1	taz_2	41.00
taz_1	taz_3	5.00
taz_1	taz_4	0.00
taz_2	taz_1	41.00
taz_2	taz_2	200.00
taz_2	taz_3	15.00
taz_2	taz_4	43.00
taz_3	taz_1	41.00
taz_3	taz_2	200.00
taz_3	taz_3	15.00
taz_3	taz_4	43.00
taz_4	taz_1	41.00
taz_4	taz_2	200.00
taz_4	taz_3	15.00
taz_4	taz_4	15.00

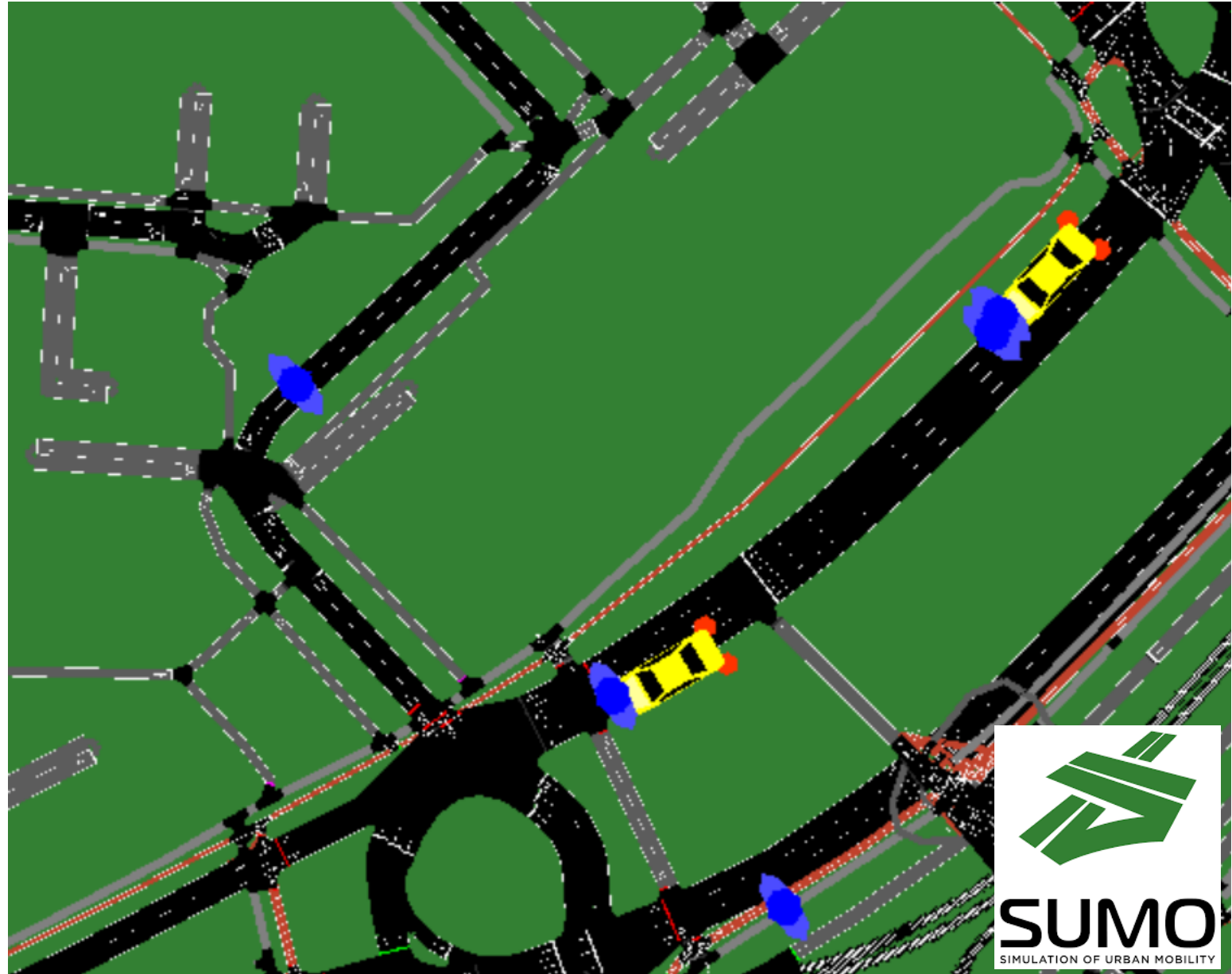
hourly traffic load curve

origin and destination matrix

Example of a 24 hour traffic load curve and the demand from each TAZ to every other TAZ in SUMO.

Simulation of On-Demand Mobility running in SUMO

Vehicles (yellow) are picking up passengers (blue) at their requested pick-up-spots (example).



Next Steps and Further Desired Research Questions

Next steps:

- Refining the frame conditions and the assumptions of the simulation (demand, user requirements, ...)
- Running the simulation and considering the results
- Varying the assumptions to gain insights about effects and interrelations
- Creating several scenarios to consider further aspects

Further desired research questions:

- Is an On-Demand service a reasonable supplement with other transport systems? → Intermodal trips, for example with inclusion of a mode choice model
- What effect do different time windows of passenger requests have on operational parameters?
- ... and many more



Thank you for your attention.

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Institutes Website:

<https://www.dlr.de/ts/en/>

SUMO Website:

<https://www.eclipse.org/sumo/>

