



Traffic Management for Connected and Automated Vehicles on Urban Corridors - Distributing Take-Over Requests and Assigning Safe Spots

Robert Alms*, Yun-Pang Flötteröd, Evangelos Mintsis, Sven
Maerivoet, Alejandro Correa

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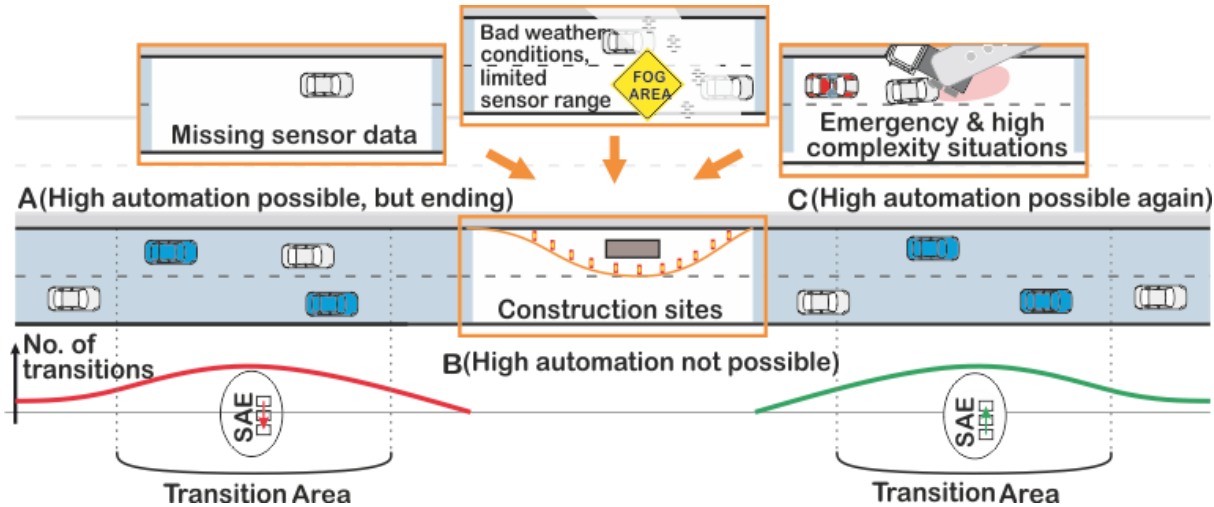


DLR German Aerospace Center
Institute of Transportation Systems, Berlin

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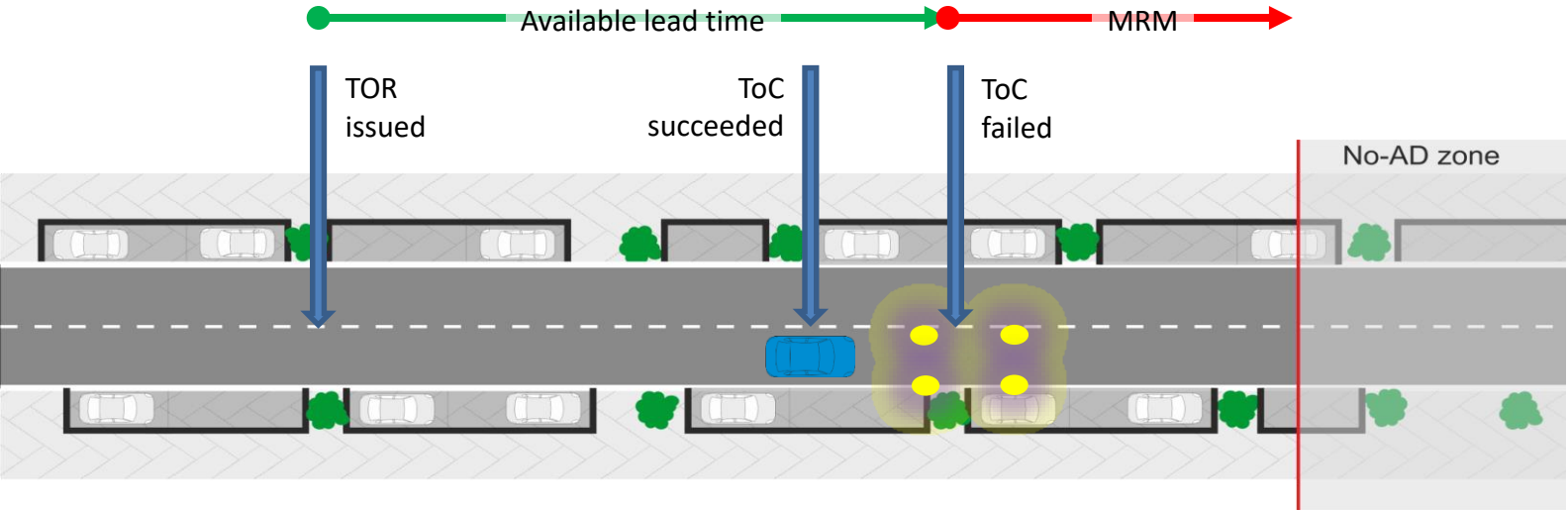
What are “Transition Areas”?



“Transition Areas” are areas on the road where many highly automated vehicles (blue) are changing their level of automation due to various reasons.



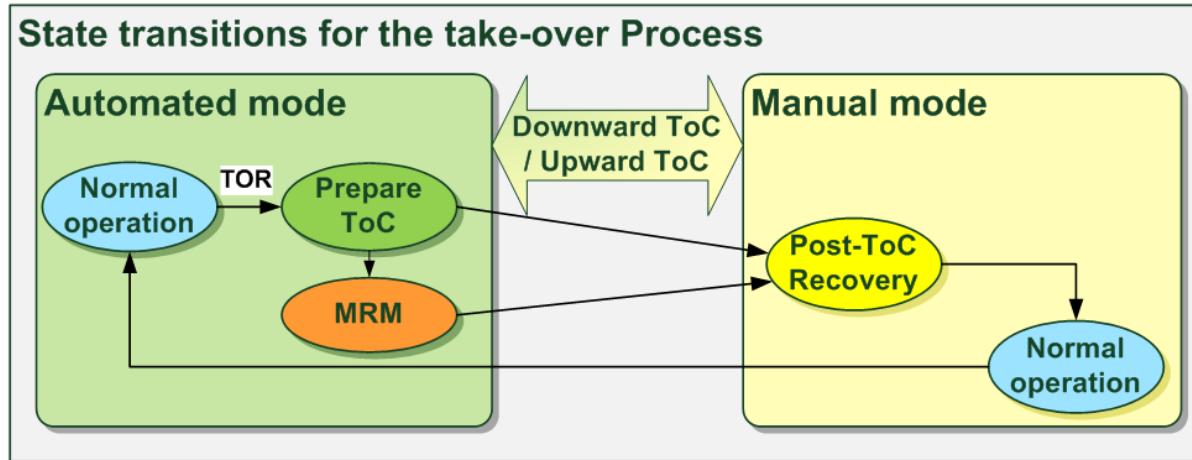
Transition of Control & Minimum Risk Maneuver in TransAID



- ToC: Transition of Control
- TOR: Take-Over Request
- MRM: Minimum Risk Maneuver



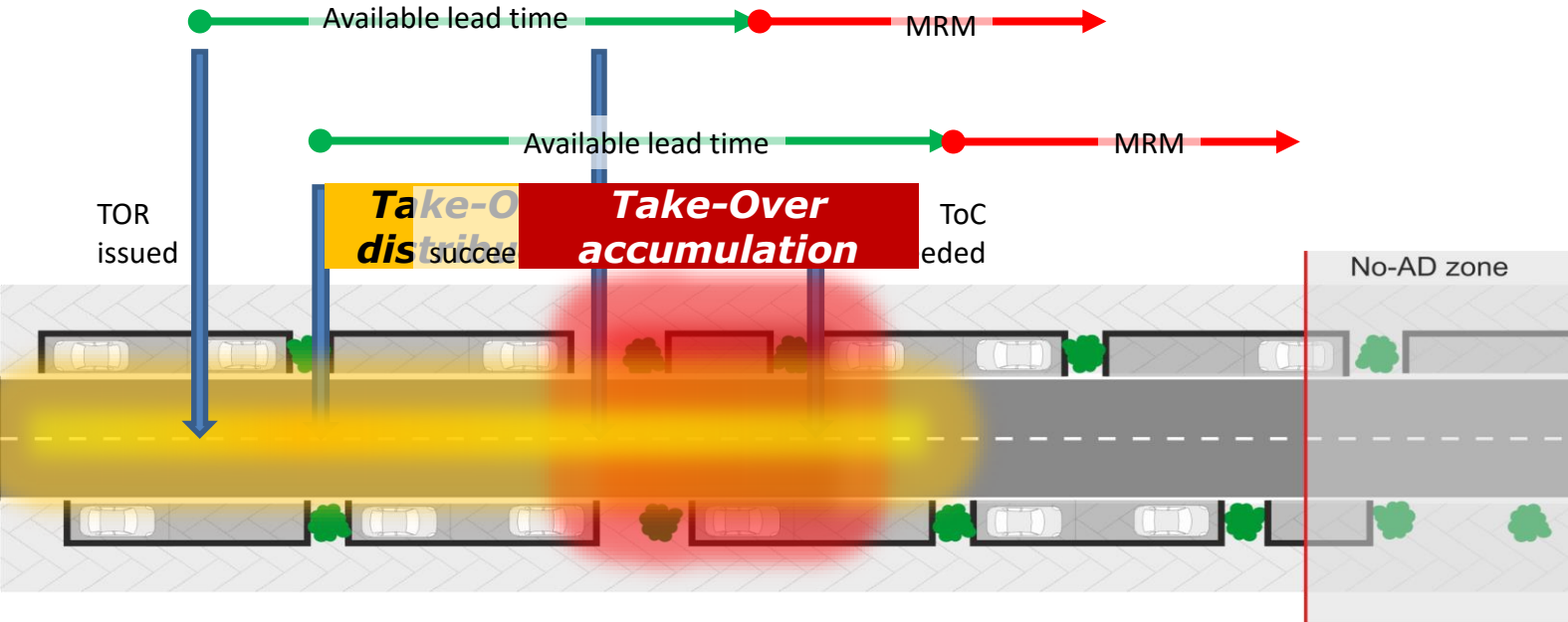
ToC / MRM Model in SUMO



- <https://sumo.dlr.de/wiki/Car-Following-Models/ACC>
- https://sumo.dlr.de/wiki/ToC_Device
- https://sumo.dlr.de/wiki/Driver_State



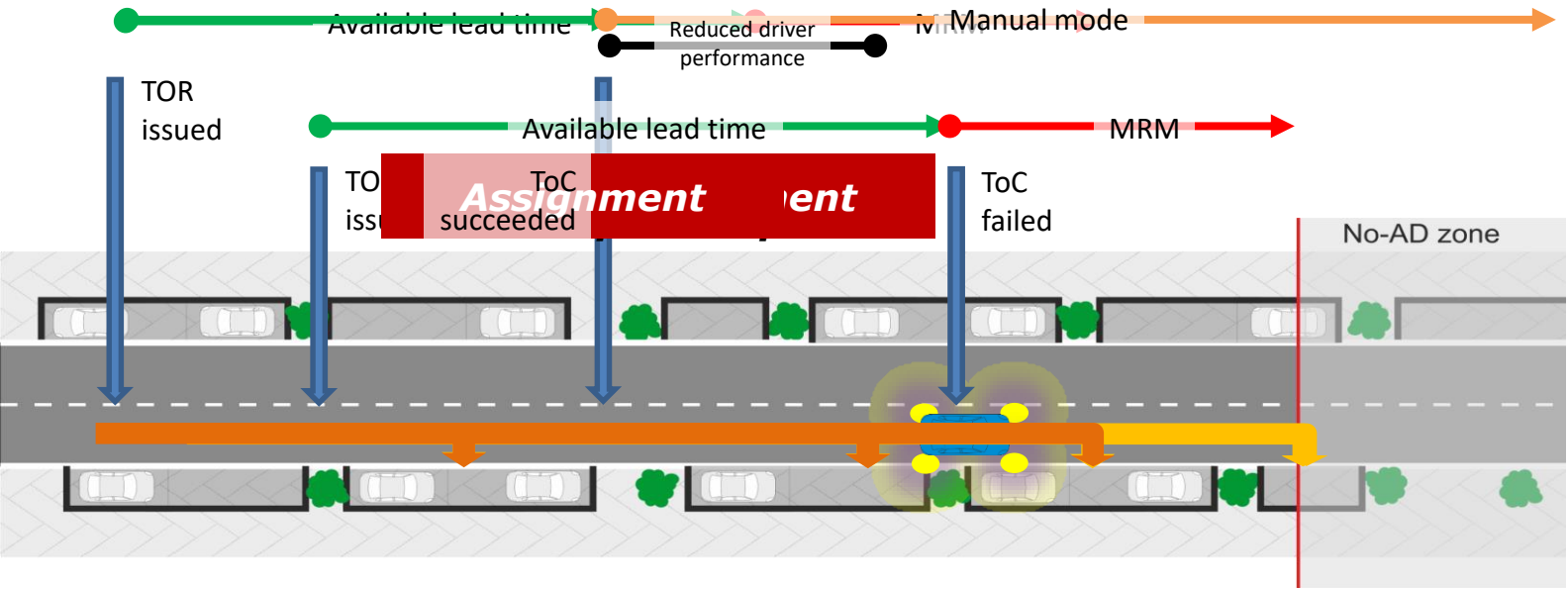
First Traffic Management Procedure: Distributing Take-Over Requests



- ToC: Transition of Control
- TOR: Take-Over Request
- MRM: Minimum Risk Maneuver



Second Traffic Management Procedure: Assigning Safe Spots



- ToC: Transition of Control
- TOR: Take-Over Request
- MRM: Minimum Risk Maneuver



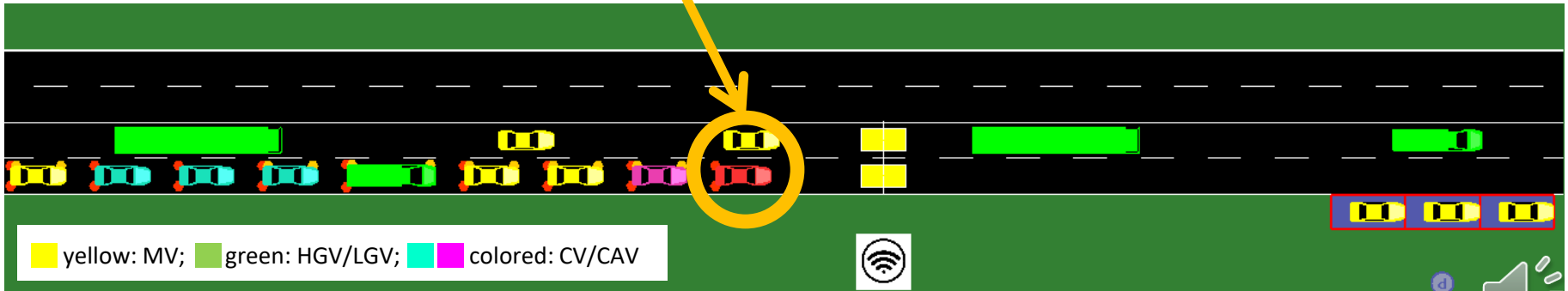
Simulation Study in SUMO

- 1h simulated time per run
- 10 runs per parameter mix
- + every 5min additional vehicle that performs MRM (red CAV)

Capacity (vehicles/hour/lane)	Level of Service (LOS)		
	B	C	D
1500 veh/h/l	825	1155	1386

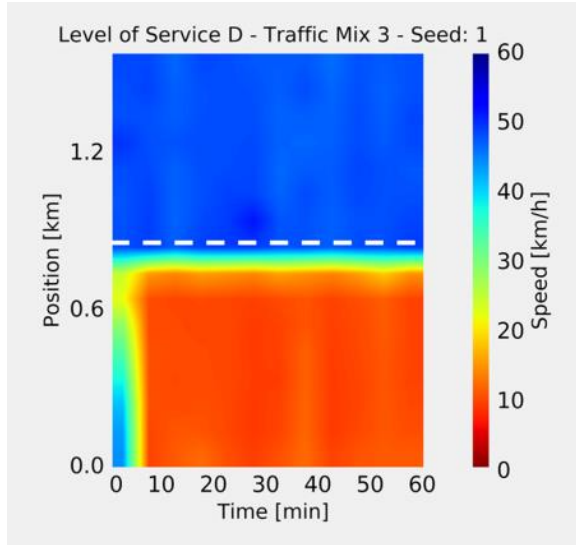
Vehicle Mix	MV	CV	CAV	HGV	LGV
1	61%	13%	13%	3%	10%
2	43%	22%	22%	3%	10%
3	17%	35%	35%	3%	10%

MV - manual vehicle; CV - connected vehicle; CAV - connected and automated vehicle; HGV – heavy good vehicle; LGV – light good vehicle

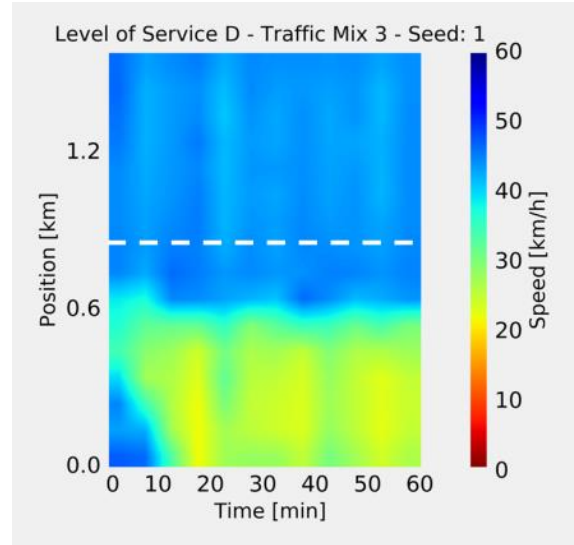


Simulation Results

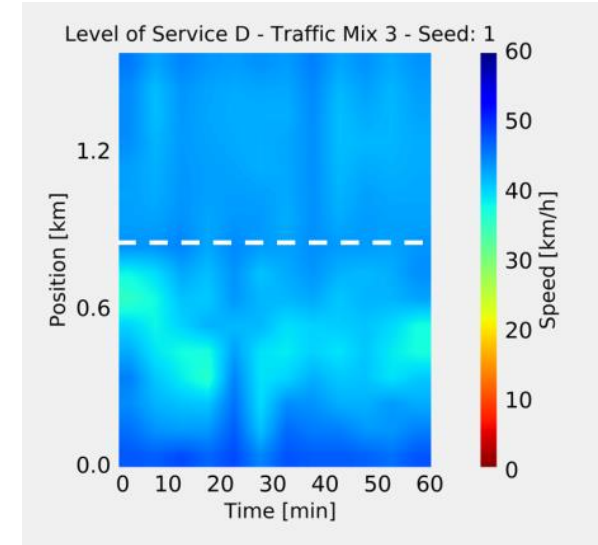
(A) no traffic management



(B) TOR distribution



(C) TOR distribution + safe spot assignment



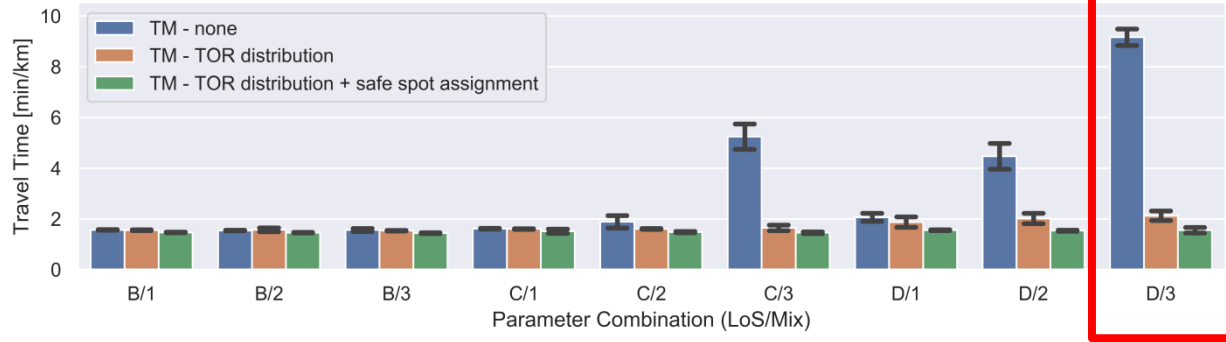
space-time-diagrams:

- above white dashed line: No-AD zone
- below white dashed line: Transition Area



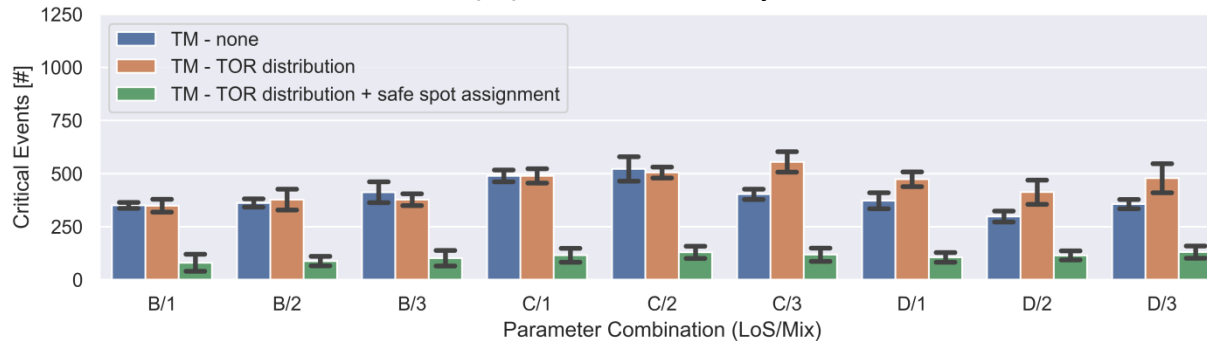
Simulation Results

(A) traffic efficiency



Parameter
Comination
from previous
slide

(B) traffic safety



3 key messages

1. Transition Areas will be part of a mixed autonomy traffic system
2. ToCs and MRMs may induce significant disruptions to traffic system
3. Infrastructure-assisted traffic management (V2X) can help to mitigate negative impacts of control transitions





Thank you!

See also:

- Mintsis et al. 2019, *TransAID Deliverable 3.1*
- Maerivoet et al. 2020, *TransAID Deliverable 4.2*

www.transaid.eu

robert.alms@dlr.de

+49 30 67055 9680