AGLOSA

Combining Adaptive Junction Control with Simultaneous Green-Light-Optimal-Speed-Advisory

DLR

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AGLOSA

AGLOSA algorithm combines an

- adaptive control algorithm (A)
- with Green-Light-Optimal-Speed-Advisory (GLOSA)

The algorithm exploits Vehicle-to-Infrastructure Communication (V2I) to extend the planning horizon and create sufficiently stable plans using dynamic programming.

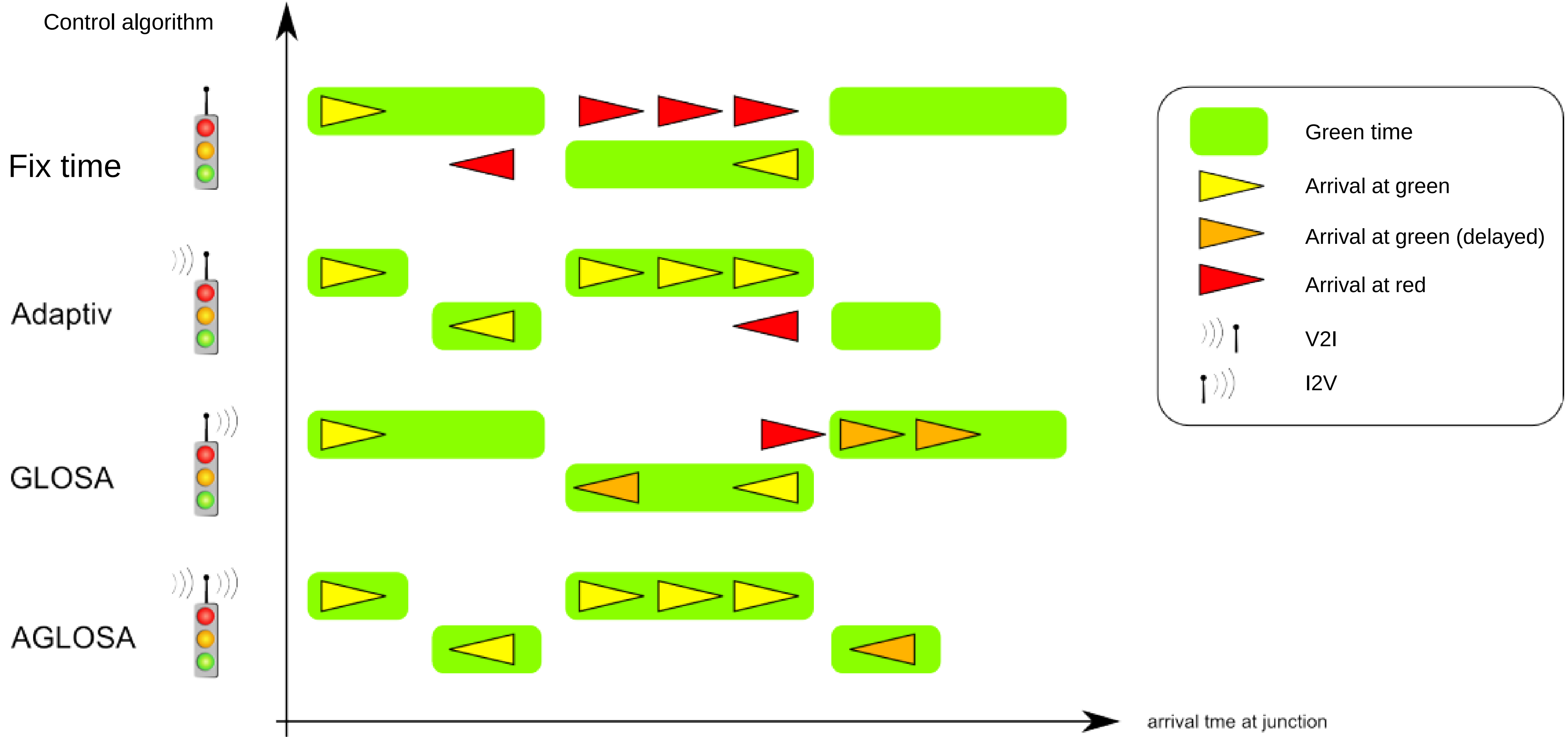
(Dynamic programming according to Bellmann)

AGLOSA

The algorithm continuously repeats the following steps:

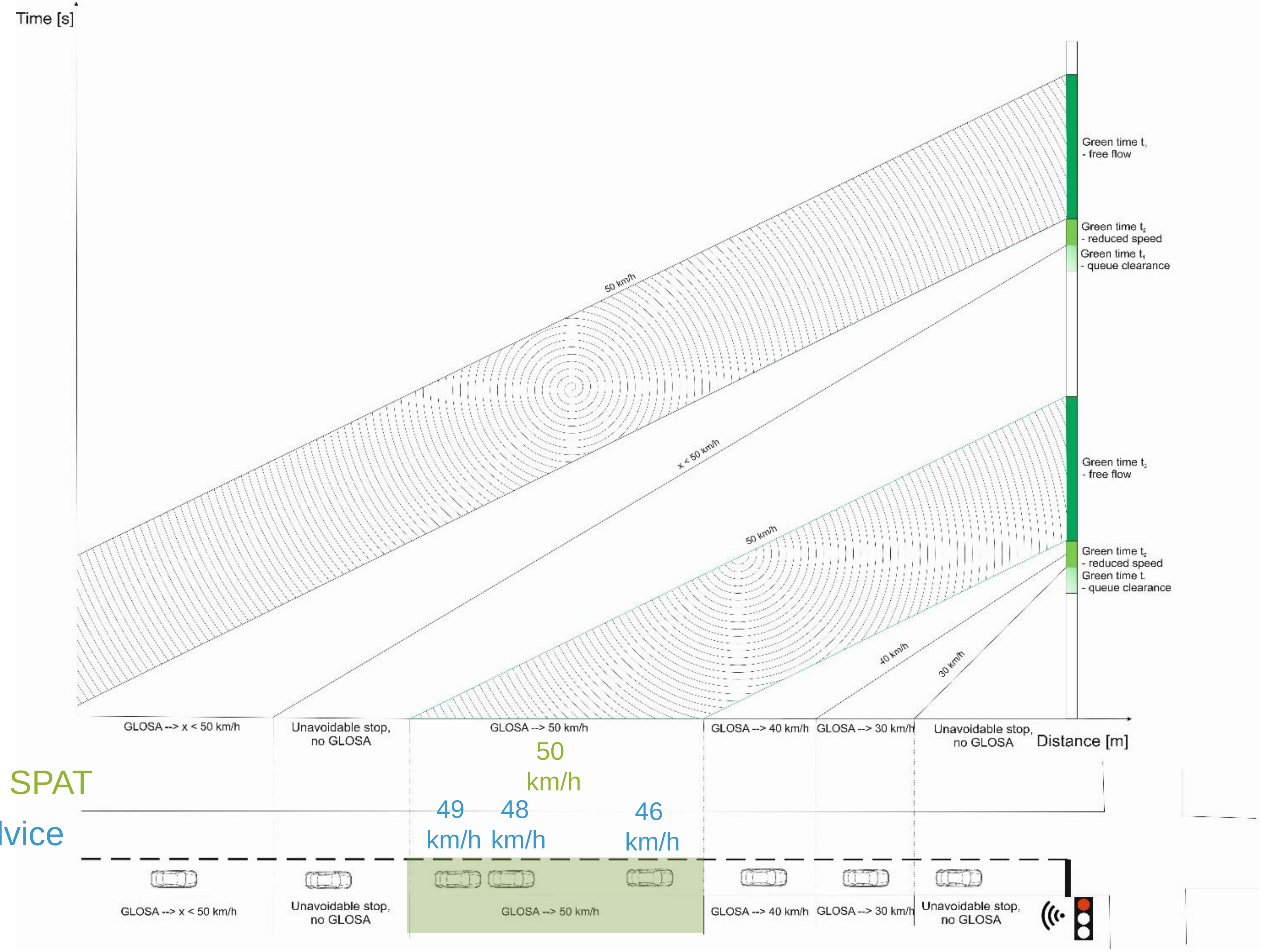
- 1. vehicles send *id, position* and *speed* to AGLOSA
- 2. AGLOSA computes optimal *signal/phase plan*
  - to minimize a given optimization goal e.g. time loss or number of stops
- 3. AGLOSA sends *target time/speed advice* to each vehicle
- 4. vehicles adapt their speed to the *target time/speed advice*

Comparison of traffic light control concepts



source: https://elib.dlr.de/84953/

AGLOSA - Zoning Concept

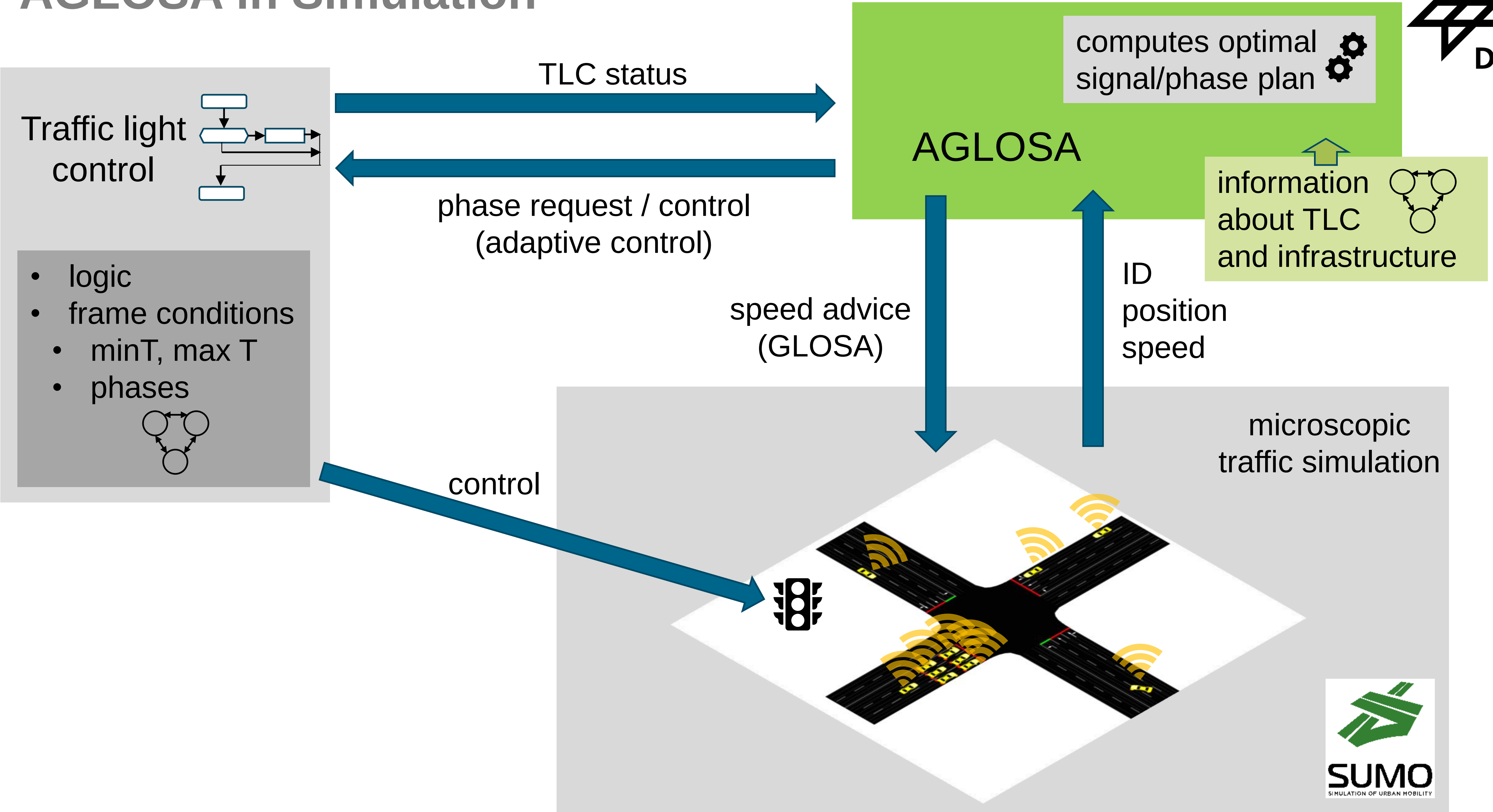


Collective advice via SPAT

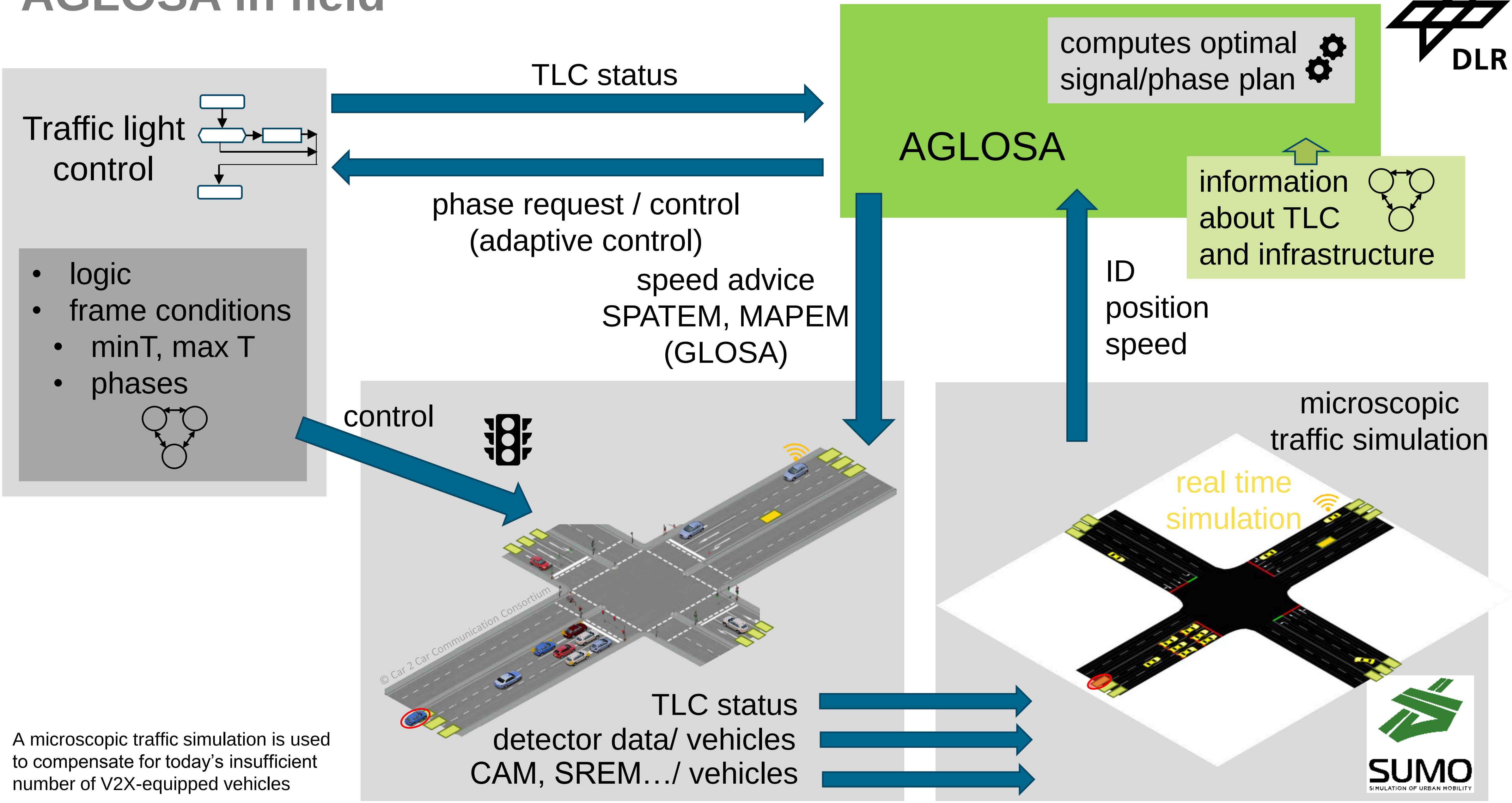
Individual advice

source:Julian Schindler, Robbin Blokpoel, Michele Rondinone, Ondřej Přibyl, Jaap Vreeswijk. (2017).
MAVEN Managing Automated Vehicles Enhances Network. Deliverable 2.2: System architecture, specifications and verification criteria.

AGLOSA in Simulation



AGLOSA in field



A microscopic traffic simulation is used to compensate for today's insufficient number of V2X-equipped vehicles

Results and Evaluation of AGLOSA

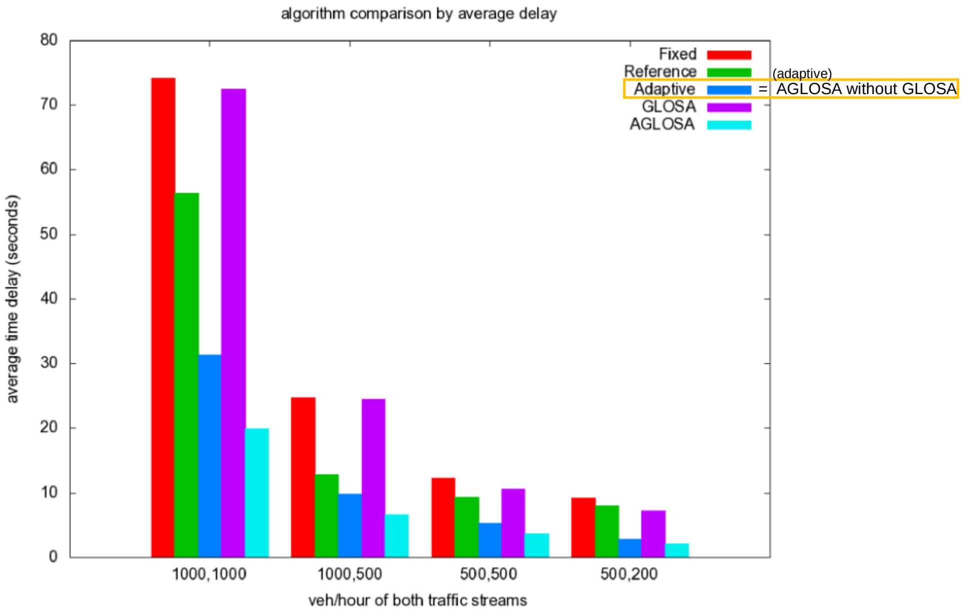
Simulation:

- comparison fix-, adaptive-, fix+GLOSA- control with AGLOSA (9 different traffic demands) Link Link
  - Average time loss
  - Maximum time loss
- comparison existing adaptive control with AGLOSA (4 different traffic demands) Link Link
  - CO_2 emissions
  - Average delay time

Implementation in Field:

- comparison of two Intersections (in Halle, Brunswick) existing adaptive control with AGLOSA Link Link
  - Average delay time:
    - signal group (without GLOSA)
    - 3 different traffic demand scenarios (without GLOSA)
- comparison intersection (Hamburg) existing adaptive control with AGLOSA (3 different demand scenarios)(and in simulation) Link Link
  - Average delay time
- Corridor co-ordination (in Halle) (and in simulation) Link
- AGLOSA used for Busprioritization Link
  - technical demonstration
- Two CAV control on AGLOSA zoning concept Link
  - technical demonstration and results

Combining Adaptive Junction Control with Simultaneous Green-Light-Optimal-Speed-Advisory



Source: https://elib.dlr.de/84953/

TABLE II. AVERAGE TIME LOSS (SECONDS)

vehicles/hour H,V	F	R	G	B	A1	A2
200,200	7.99	6.53	7.35	1.65	1.35	1.24
500,200	9.30	7.77	7.93	2.92	2.38	2.13
500,500	12.39	9.32	11.52	5.40	3.98	3.73
1000,200	13.51	8.59	12.56	4.59	3.89	3.46
1000,500	24.88	12.75	24.65	9.76	7.00	6.68
1500,200	15.21	10.41	27.90	9.43	8.49	7.62
1000,1000	74.39	52.35	117.24	31.26	21.22	20.74
1500,500	63.85	48.08	117.99	25.87	17.82	17.23
2000,200	132.39	133.92	160.21	19.71	17.31	17.43

TABLE III. MAXIMUM TIME LOSS (SECONDS)

vehicles/hour H,V	F	R	G	B	A1	A2
200,200	41	34	32	36	34	25
500,200	87	44	74	76	70	76
500,500	58	51	45	46	44	43
1000,200	237	99	237	121	124	107
1000,500	121	84	134	90	103	68
1500,200	251	183	670	389	445	389
1000,1000	186	186	158	153	137	139
1500,500	460	361	463	209	151	186
2000,200	1435	1448	1783	4990	8961	9970

- **F:** fixed control (formula according to Webster [7])
- **R:** reference adaptive control (using time headways measured at induction loops)
- **G:** fixed control as in **F** and GLOSA
- **B:** the AGLOSA algorithm variant A2 with the GLOSA-part switched off
- **A1:** the AGLOSA algorithm variant A1
- **A2:** the AGLOSA algorithm variant A2

Source: https://elib.dlr.de/82952/

VITAL: Traffic Signal Control Based on V2X Communication Data – Application and Results from the Field

Source: https://elib.dlr.de/202280/ and https://elib.dlr.de/119877/

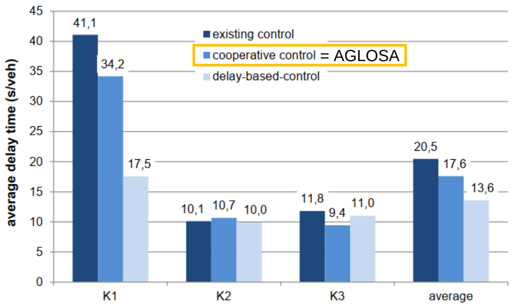


Fig. 6. Halle (Saale) – average delay time per vehicle during the period 05.09.-02.10.16, classified by signal groups K1-3 and average.

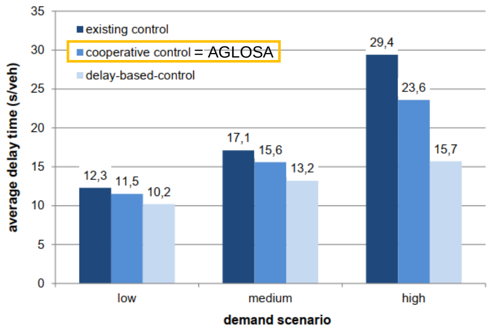


Fig. 7. Halle (Saale) – average delay time per vehicle during the period 05.09.-02.10.16, classified by demand scenario.

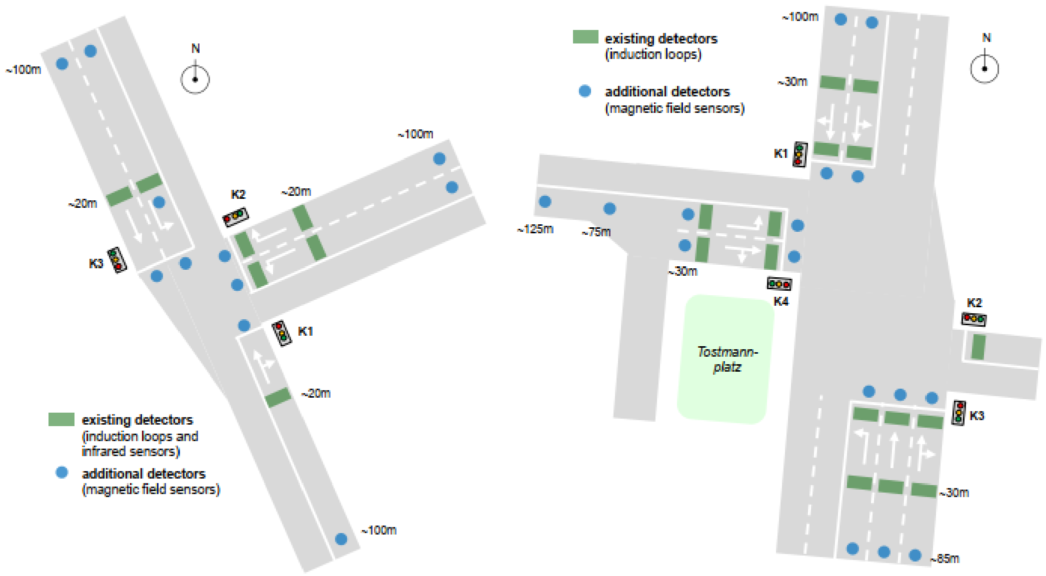


Fig. 2. Setup of detectors at the test intersections in Halle (Saale) (left) and Braunschweig (right).

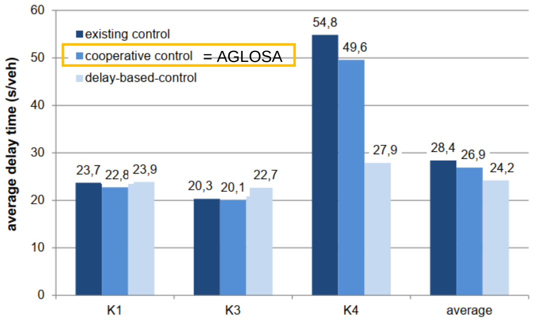


Fig. 9. Braunschweig - average delay time per vehicle during the period 16.09.-26.10.16, classified by signal groups K1, K3, K4 and average.

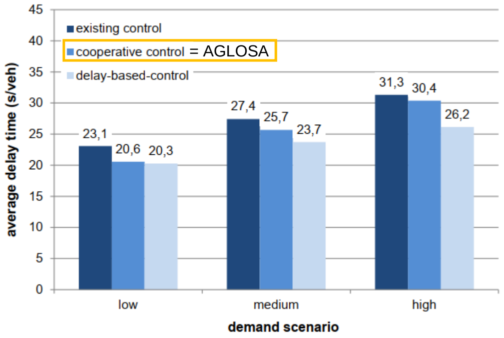


Fig. 10. Braunschweig - average delay time per vehicle during the period 16.09.-26.10.16, classified by demand scenario.

VITAL: a simulation-based assessment of new traffic light controls

Source: https://elib.dlr.de/98478/ Link

TA = traffic-actuated control

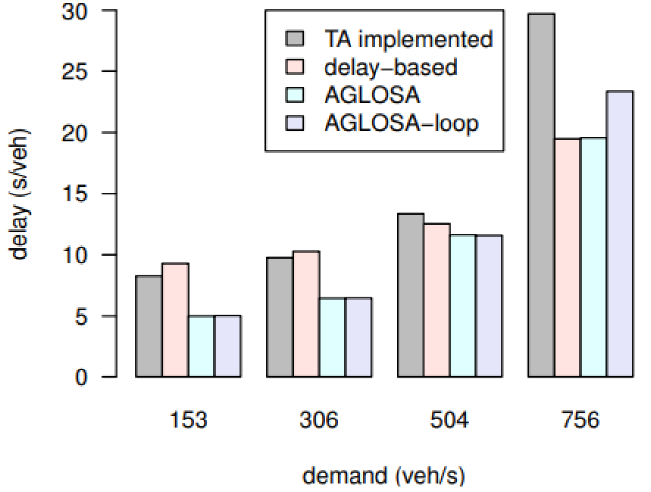


Fig. 4. Simulated delay times for the four different methods under consideration and for the four different demand scenarios described in the text.

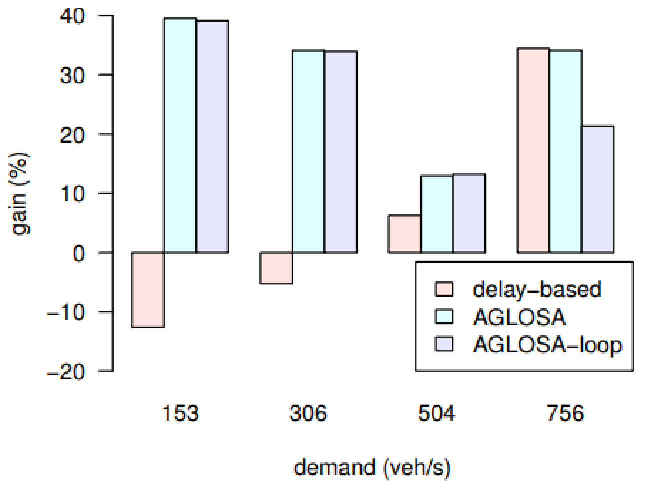


Fig. 5. Gain of the three new methods compared against the currently implemented TA.

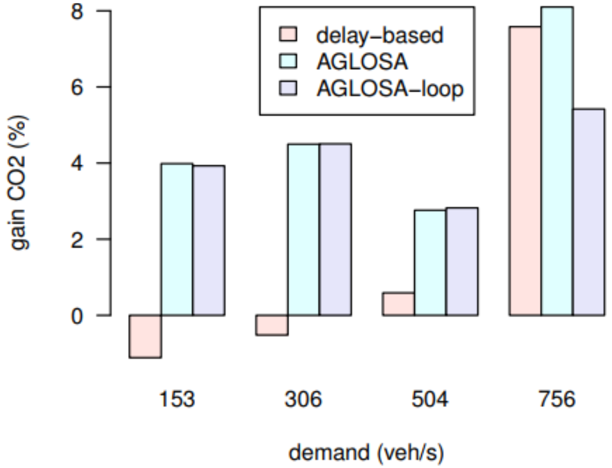


Fig. 6. Gain of the three new methods compared against the currently implemented TA when CO_2 emissions are used as the performance indicator.

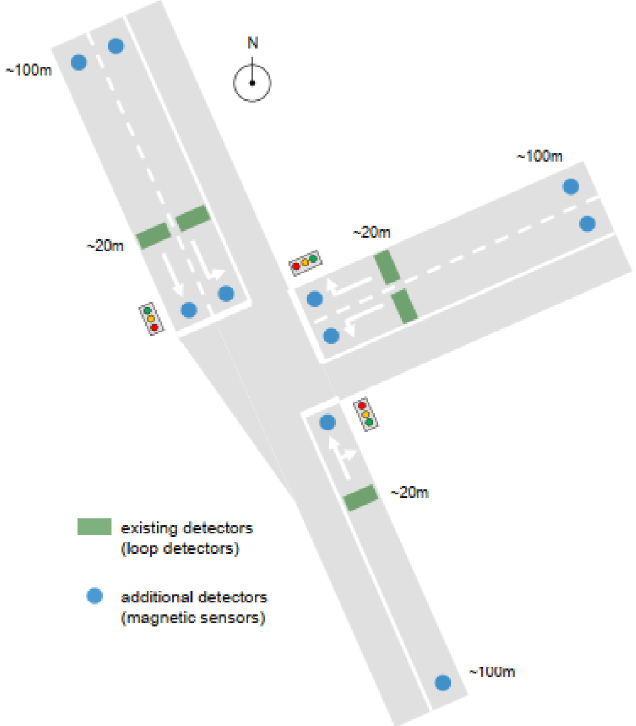


Fig. 2. The intersection in Halle with the existing and the additional detector set-up.

Thank you for your attention!

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