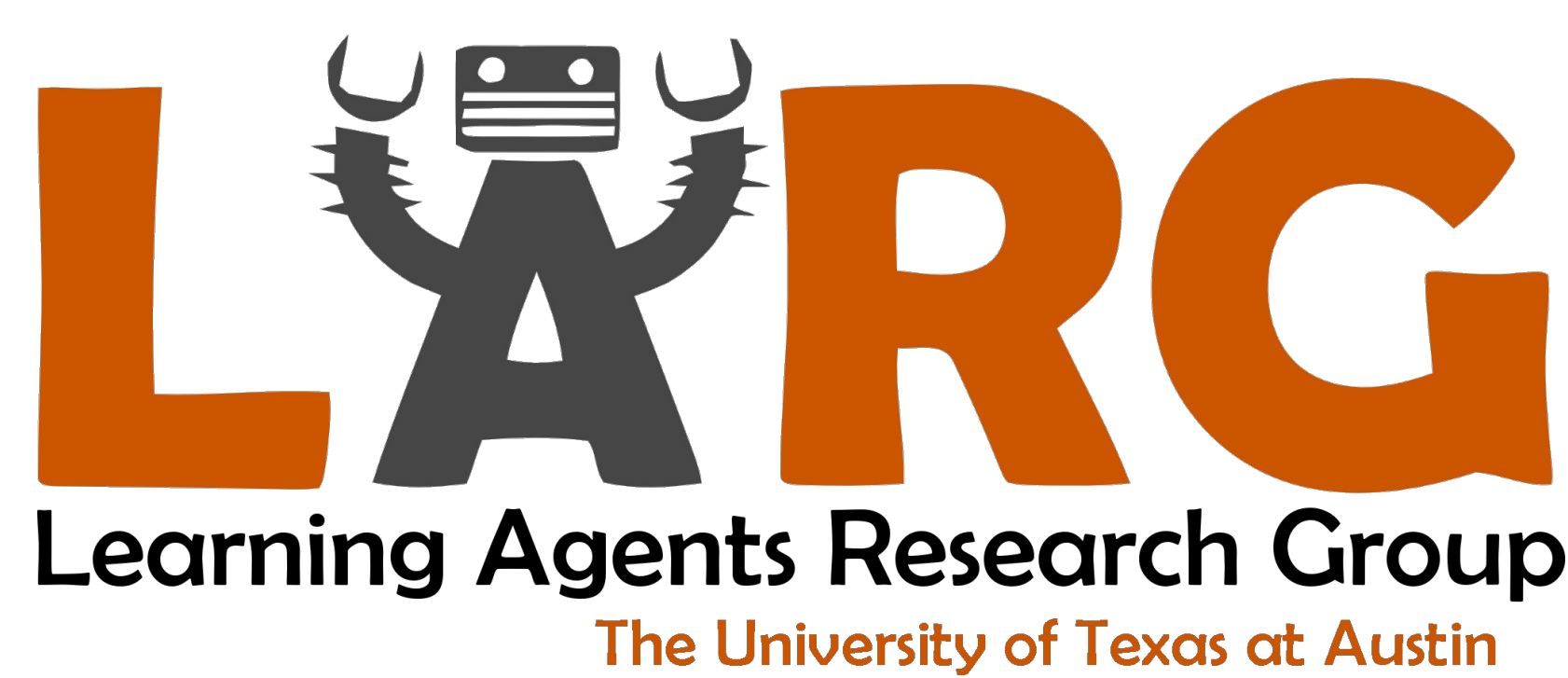


Semi-Autonomous Intersection Management

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Full Paper in
ARMS 2014!

Previous Work: Autonomous Intersection Management (AIM)

- The AIM protocol
- A fine control of autonomous vehicles.
 - More vehicles simultaneously to cross an intersection.
 - Effectively reducing the delay of vehicles.



Our
Autonomous
Vehicle!



Limitations of AIM

- Designed for the time when vehicles are autonomous.
- A long transition period during which most vehicles have limited capabilities.
- New term: **semi-autonomous vehicles**
- Vehicles with limited autonomous driving and wireless communication capabilities.

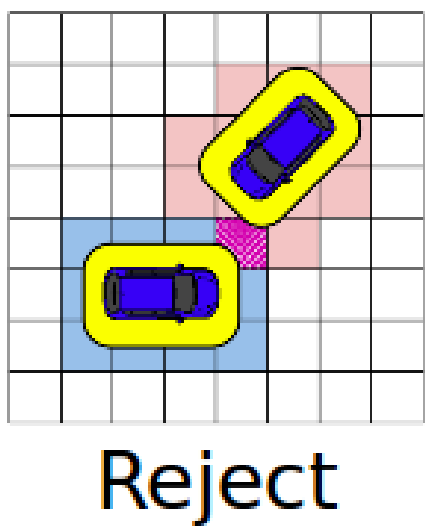
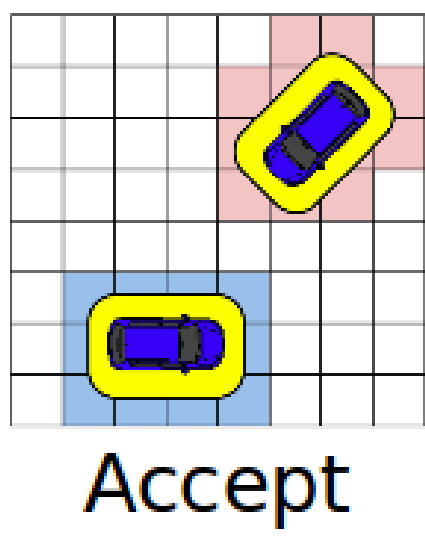
Semi-Autonomous Vehicles

- General enough to accept reservation requests from any semi-autonomous vehicles.
- We focus on the three types of semi-auto vehicles.

Vehicle Type	Communication Device	Cruise Control	Adaptive Cruise Control
SA-ACC	X	X	X
SA-CC	X	X	
SA-Com	X		

Constraint-Based Reservation

- Intention: The direction in which the vehicle intends to move.
- Vehicle Type: The type of vehicle.
- Entry Condition: The condition under which the vehicle will enter the intersection.
- Acceleration Profile List: The list of possible acceleration schedules from among which the vehicle will choose one to follow during the traversal of the intersection.

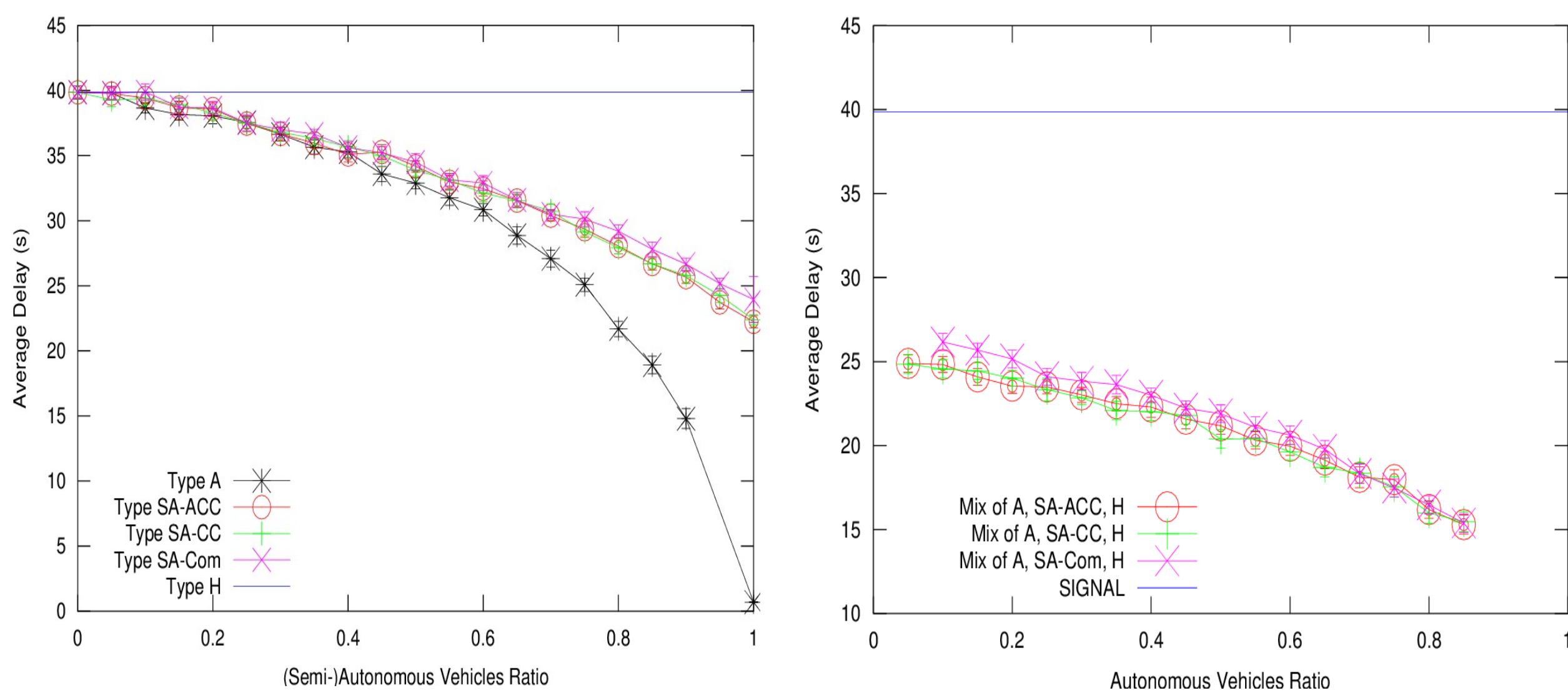


Experiment settings:

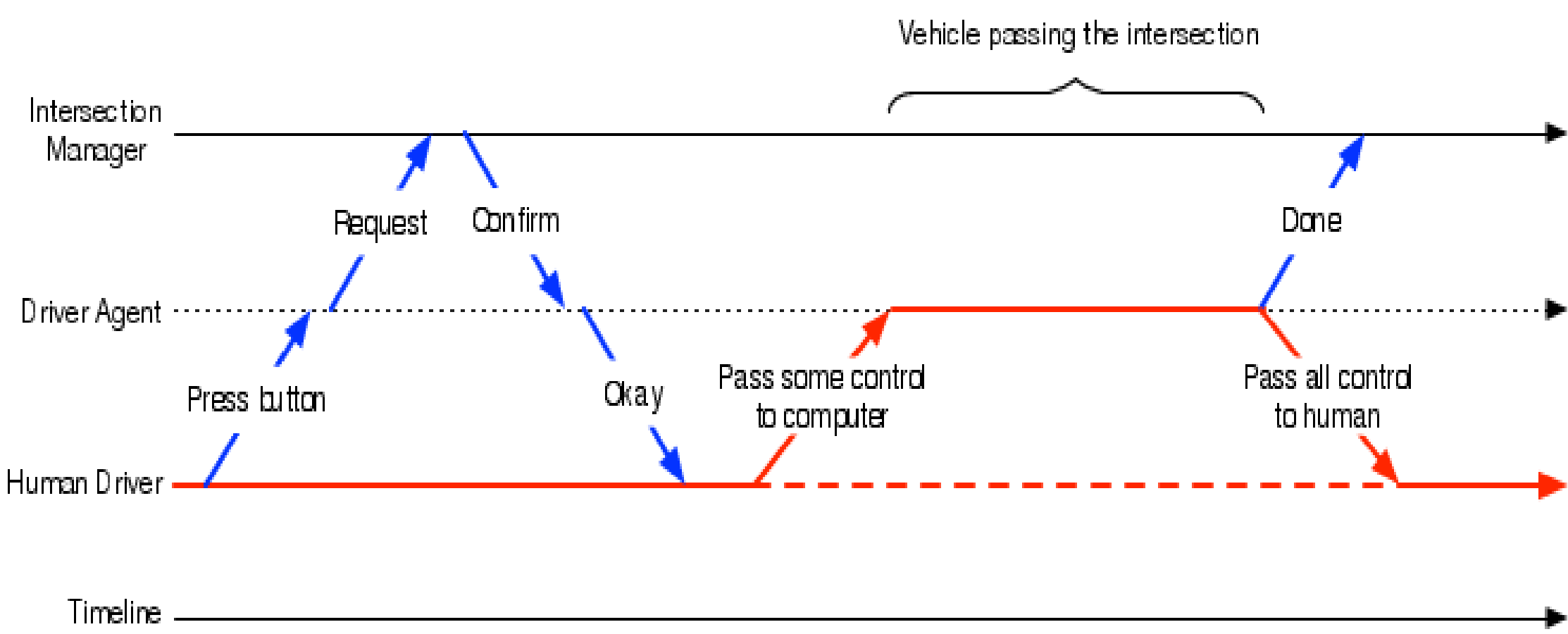
- Intersection: 3 lanes on each road.
- Traffic: 360 vehicles/hour/lane.
- Type of vehicles: Fully Autonomous, Adaptive Cruise Control, Cruise Control, Communication Device and Traditional Human-driven.

Experiment results:

- Semi-autonomous vehicles is very similar to fully autonomous vehicles when the ratio to human-driven vehicles is below 40%.
- Beyond 40%, fully autonomous vehicles increasingly outperform semi-autonomous vehicles.



Interaction Model



Conclusion

- The first multiagent protocol to enable smooth interactions between human-driven, fully autonomous, and semi-autonomous vehicles.
- Showed that our system can greatly decrease traffic delay when most vehicles are semi-autonomous.

References

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