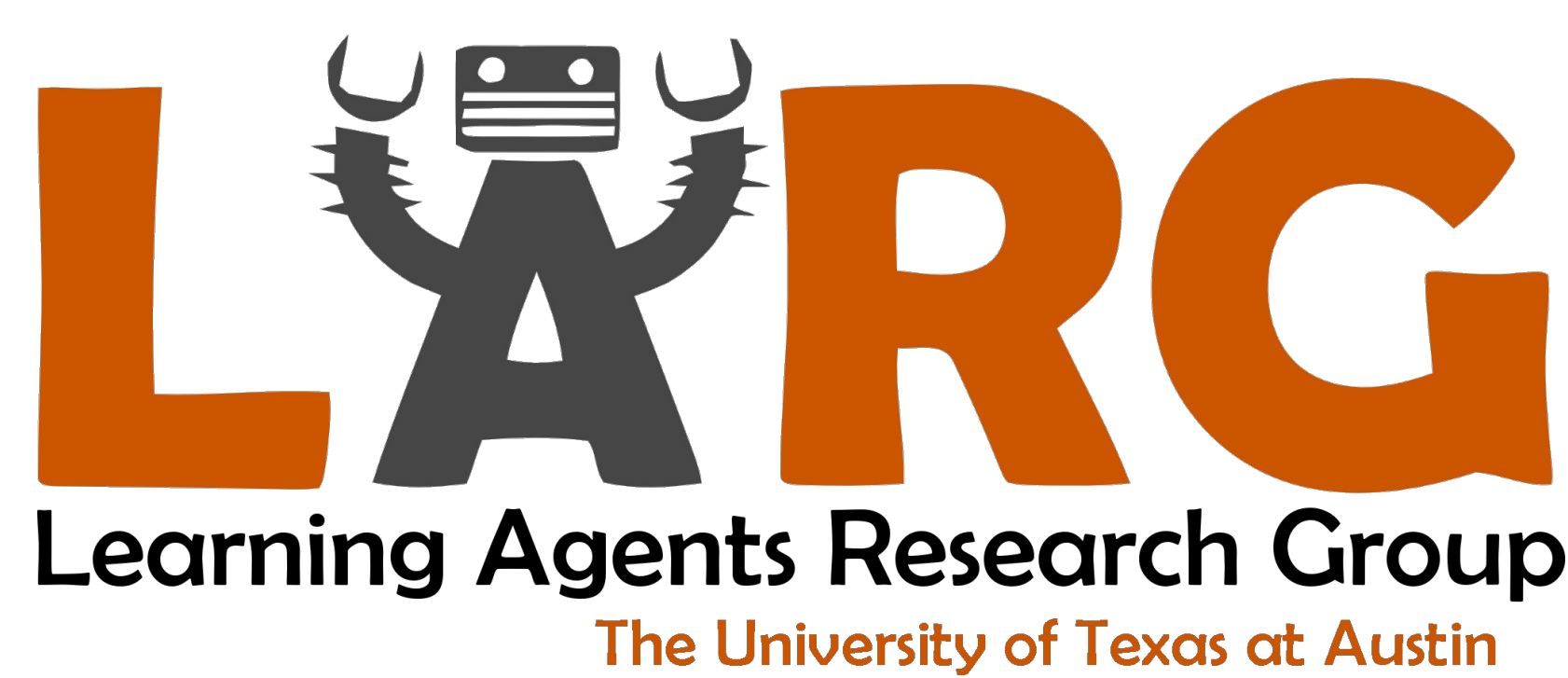


# Semi-Autonomous Intersection Management

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Full Paper in  
ARMS 2014!

## Previous Work: Autonomous Intersection Management (AIM)

- The AIM protocol
- **Fine control** of autonomous vehicles.
  - More vehicles can **simultaneously** cross an intersection.
  - Effectively **reduces 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.

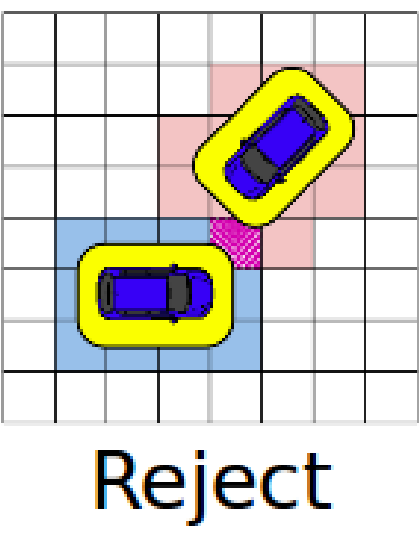
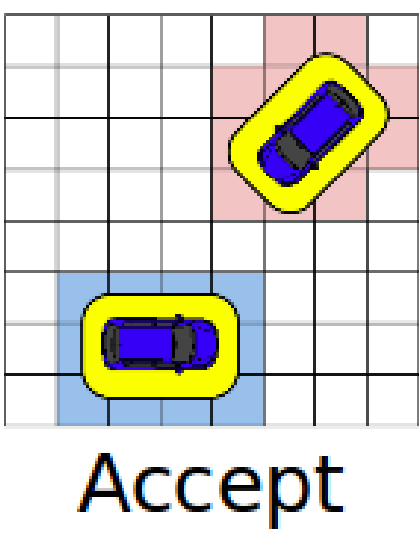
## Semi-Autonomous Vehicles

- 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.

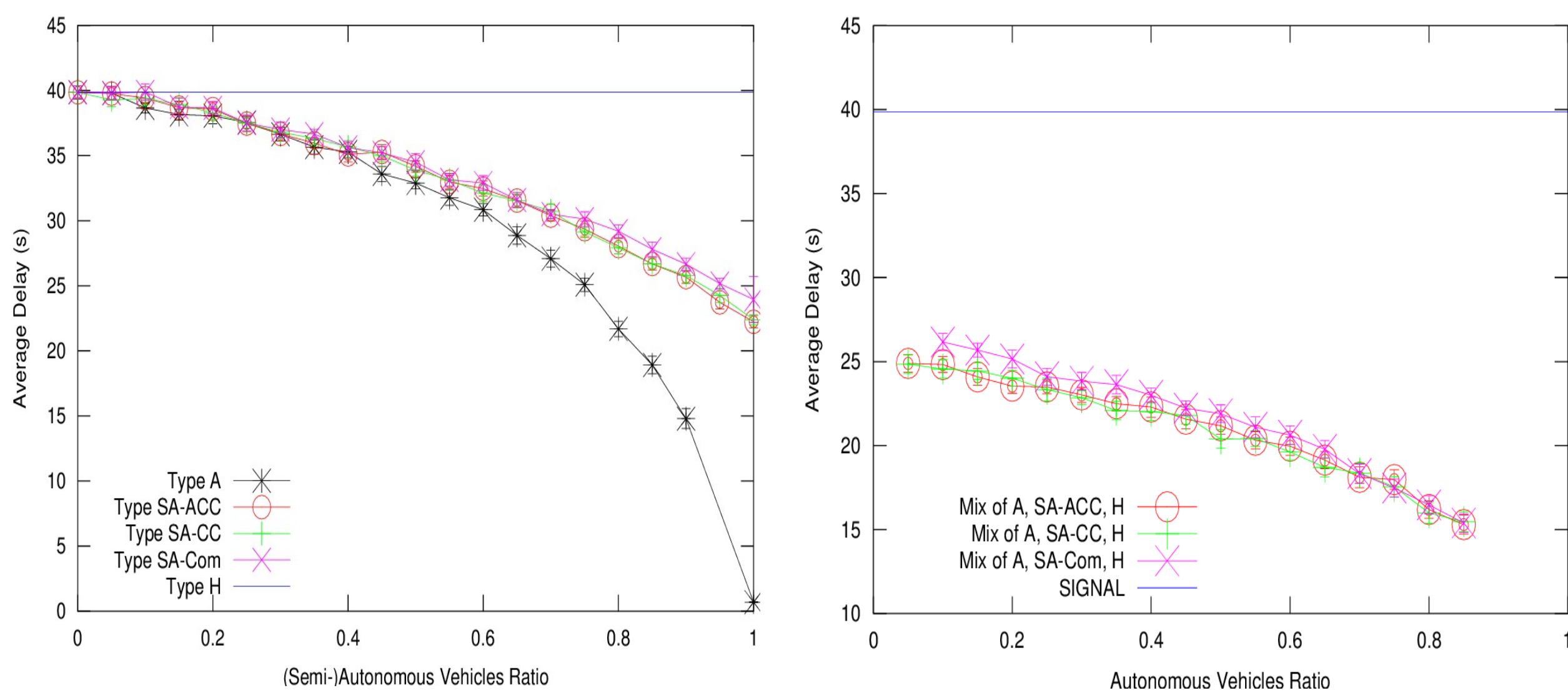


## Experiment settings:

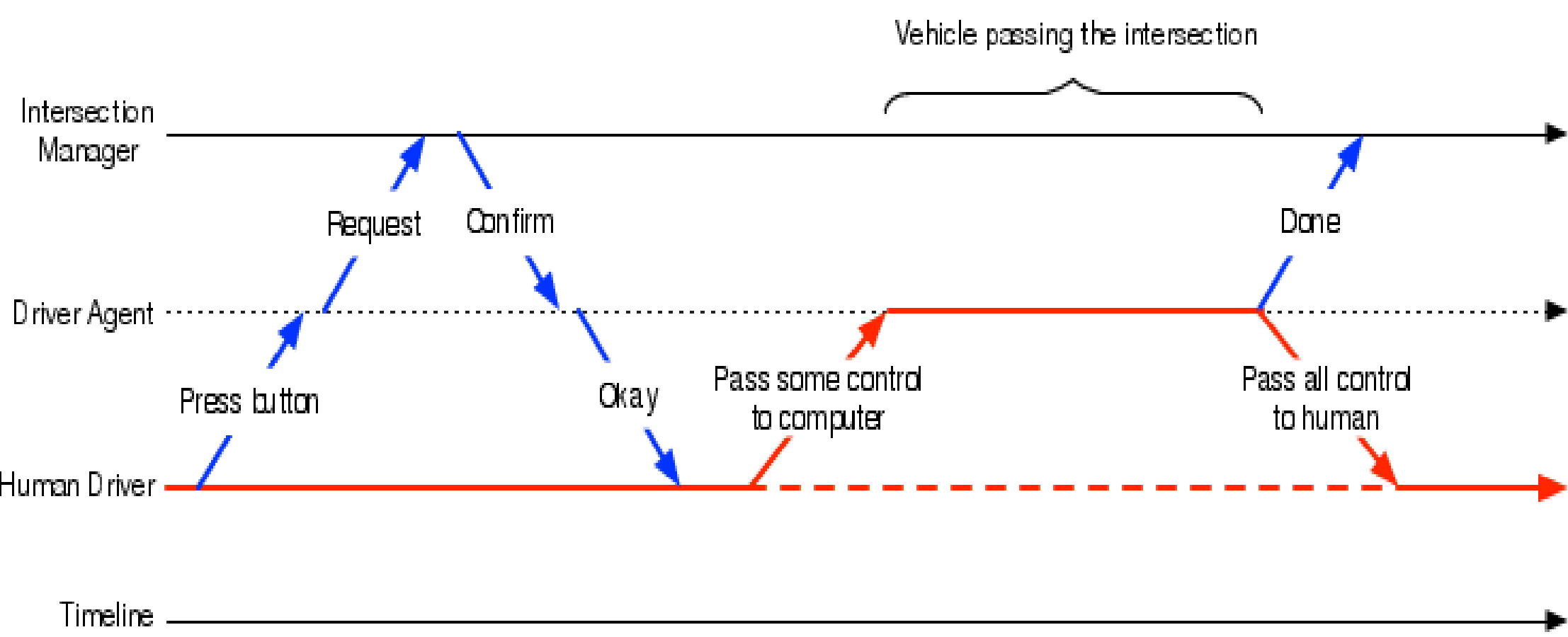
- Intersection: 3 lanes on each road.
- Traffic: 360 vehicles/hour/lane.
- Type of vehicles: Fully Autonomous, Adaptive Cruise Control, Cruise Control, Communication Device and Traditional Human-driven.

## Experiment results:

- Semi-autonomous vehicles **perform similarly 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

- This is 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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[3] K. Dresner and P. Stone. A multiagent approach to autonomous intersection management. Journal of Artificial Intelligence Research (JAIR), March 2008 Etc.