

## Integration of Autonomous Vehicles with Adaptive Signal Control to Enhance Mobility

**Purpose:** The project aimed to demonstrate and evaluate vehicle-to-infrastructure (V2I) route sharing performance in the field to further optimize traffic signal control performance through communication of real-time connected autonomous vehicle route information.

**Approach:** The team worked in collaboration with Argo AI, an autonomous vehicle technology company, and Rapid Flow Technologies, Inc., provider of the Surtrac adaptive traffic signal control system, to use the Pittsburgh Surtrac controlled traffic network and a cloud-based infrastructure to enable direct V2I communication of Argo AI vehicle routes to Surtrac and use of this information to further optimize traffic signal control decisions.

**Key Findings:** Argo vehicles experienced an average reduction in delay of 20% when they shared their routes. Additional analysis of overall Surtrac network delay indicated essentially no change in travel time performance to other vehicles.

**Conclusion:** The field experiment produced results comparable to those reported in prior simulation studies. Rapid Flow Technologies, Inc. has subsequently carried out a more structured evaluation using municipal vehicles that showed even larger average reductions in delay to vehicles willing to share their routes. The researchers believe that route sharing can offer an unprecedented opportunity to accelerate the deployment of adaptive signal control technology in cities, vastly improving travel times while also providing a more sustainable approach to managing transportation infrastructure.

Future research directions include:

- Use of real-time bus information to more accurately predict arrival times to enable traffic signal control decisions to give priority to transit while optimizing other traffic flows
- Use of V2I communication with various municipality vehicles to prioritize their movements in appropriate situations (snowstorms, emergencies, etc.)
- Use of P2I communication to provide support for safe intersection crossing by pedestrians with disabilities
- Use of route sharing as a basis for voluntary, incentive-based tolling at signalized intersections, providing municipalities with a revenue stream that can enable faster and more sustainable acquisition of real-time adaptive signal control technology.

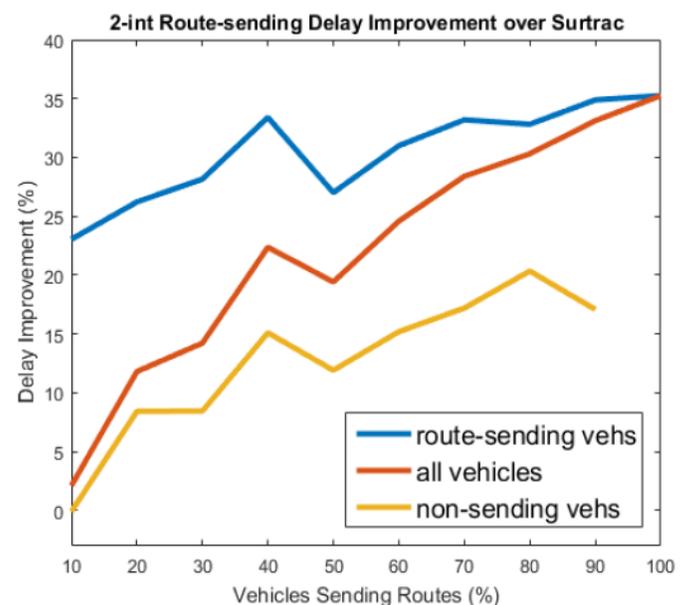


Figure 1: Route sharing results from [Hawkes 2016]

### Research Team:

- Stephen Smith (Principal Investigator)  
<https://orcid.org/0000-0002-7053-3166>

### Project Record:

- <https://ppms.cit.cmu.edu/projects/detail/294>

### Follow Us:

 [www.facebook.com/traffic21.tset](http://www.facebook.com/traffic21.tset)

 @Traffic21CMU

The contents of this *Research Recap* reflect the views of the final research report authors, who are responsible for the facts and the accuracy of the information presented herein. This document is disseminated under the sponsorship of the U.S. Department of Transportation's University Transportation Centers Program, in the interest of information exchange. The U.S. Government assumes no liability for the contents or use thereof.