Research Fact Sheet

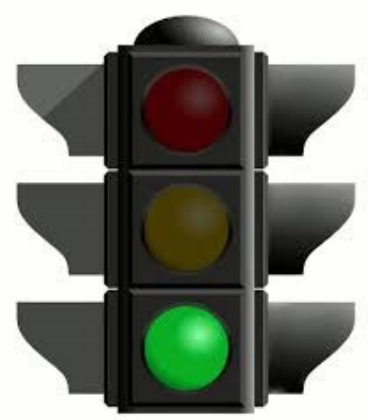
Research project: Developing a Connected Vehicle Transit Signal Priority System (Part I)

What's the issue?

Transit signal priority (TSP) systems adjust the timing of a traffic light to let buses have additional or alternative green time. Considering factors like approaching emergency vehicles and pedestrians, it's difficult enough to do that for one intersection, let alone for an entire corridor. But as any driver knows, catching all the green lights speeds you on your way; that's especially true for bus passengers on a bus.

What did the research discover?

Traditionally, these systems involved emitters installed on transit vehicles and optical detectors located at traffic signals, which worked one intersection at a time. But connected vehicles (CVs) potentially can exchange real-time information among vehicles and infrastructure. To harness this potential, the research team developed the novel DNB controller to improve transit flow. The DNB controller is a de-centralized adaptive traffic signal controller with a flexible phasing sequence and cycle-free operation that uses a Nash bargaining game-theoretic framework to optimize the total queue length based on CV data. The DNB controller optimizes the traffic signal timings at each intersection by modeling each phase as a player in a game, where players cooperate to reach a mutually agreeable outcome. The developed system was implemented and evaluated in INTEGRATION microscopic traffic assignment and simulation software. Researchers compared it to four other types of controllers. They found that the new system outperformed the others, reducing vehicle stops, vehicle travel time, passenger travel time, vehicle total delay, vehicle stopped delay, fuel, and CO2 emissions. Transit vehicles reduced their average vehicle travel time up to 15.6%, average passenger travel time was reduced up to 15.23%, average total delay was reduced up to 23.32%, average stopped delay was reduced up to 68.27%, and fuel consumption was reduced up to 6.17%.



How can I implement this?

You can't – yet. The controller performed well when tested in a simulation of downtown Los Angeles as well as Blacksburg, Virginia, but it was just simulation. Also, the level of CVs needed is not yet available on real roads, although that technology is coming fast.

Learn more:

Information about the project and the full report are available at https://www.morgan.edu/school_of_engineering/research_centers/urban_mobility_and_equity_center/research/completed_research/connected_vehicle_transit_signal_priority_system.html

The Urban Mobility & Equity Center is a federally funded research consortium led by Morgan State University and includes the University of Maryland and Virginia Tech. www.morgan.edu/umec