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Improving road efficiency

BURLINGTON PONDERS SMART TRAFFIC LIGHTS

By John Michael McGrath

While the debate continues concerning whether road tolls, HOV lanes or other measures are needed to curb congestion, one **University of Toronto** researcher wants to make sure the region doesn't forget another weapon in the war on gridlock: using existing roads more efficiently. To that end**, Baher Abdulhai** built a smarter traffic light—and the early results are so promising that Burlington staff say a real-world test could be less than a year away.

"It's ready, we're willing to move on field operations tests in a few weeks if we fi nd a willing host municipality," professor Abdulhai told NRU in an interview this week.

Burlington transportation services director **Bruce Zvaniga** says the city is interested in moving forward on a real-world test of Abdulhai's work.

"I think certainly within the next year there's potential to see a trial on the street," Zvaniga told NRU.

What has Zvaniga interested is Abdulhai's innovation on the common traffic light controller. Many cities currently control their traffic lights based on simple time-of-day models, a method that hasn't changed since the 1980s.

More modern systems allow centralized controllers to change the traffic light patterns in response to congestion. Abdulhai's system, called MARLIN, goes further by adding a smarter computer system at the traffic light itself, and networking traffic light controls together so they can communicate with each other instead of one central command.

So far MARLIN has only been tested in simulations, but the results are impressive. The use of MARLIN resulted in shorter intersection delays and queue lengths, and higher vehicle throughput. In a simulated Gardiner Expressway scenario the improvements in travel time and vehicle flow were as high as 30 and 40 per cent, with better performance at some off ramps and intersections. An added bonus was the predicted decrease in greenhouse gas emissions.

Networking the streetlight controllers seems to make all the difference, Abdulhai says. The controllers displayed surprisingly intelligent decisions to deal with the congestion.

“For example, as one intersection became congested it signalled to lights upstream and they began extending their red lights,” Abdulhai explained. While longer red lights may sound like an increase in congestion, the slight delays upstream cleared the simulated congestion downstream, with the networked controllers responding automatically to congestion before a central controller would have identified a problem.

While Zvaniga says Burlington is “very interested” in Abdulhai’s work, he does point out there are limits to what computing power can overcome.

“The system handles the beginning and end of rush hour much more effectively,” explained Zvaniga. “But at the busiest times in the depth of rush hour there are simply too many cars. There’s not a lot you can do.”

MARLIN is designed to be integrated into existing traffic controllers, so Zvaniga says it could potentially be a “plug-in” supplement to the city’s traffic control system.

Abdulhai hopes that while the region discusses the merits of measures such as road tolls to manage road demand and highway expansions to increase supply, it will also consider a third option: using the existing capacity more efficiently by making streets smarter.

A discussion of MARLIN is included in a report prepared for the **Residential and Civil Construction Alliance of Ontario** earlier this month. In it Abdulhai also highlights the potential for intelligent traffic management to improve emergency evacuation performance and enable dynamic congestion charges.

Abdulhai will be leading a workshop for municipal councillors as well as TTC and Metrolinx staff on May 1 to discuss MARLIN and other elements of the RCCAO report. Intelligent traffic management will also be front and centre when the Intelligent Transportation Systems Society of Canada holds its annual general meeting at Fairmont Royal York on May 26-29.