Organic traffic lights

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Controlling road traffic in congested areas is difficult to say the least, a point to which any drive-time urban commuter might testify. An organic approach to traffic lights, might help solve the problem and avoid traffic jams and gridlock, according to research published this month in the *International Journal of Autonomous and Adaptive Communications Systems.*

According to Holger Prothmann of the Karlsruhe Institute of Technology, and colleagues there and at Leibniz Universität Hannover, Germany, so-called "organic" computing can model even very complex systems. In recent years, they explain organic computing has emerged as a possible solution to a wide range of problems involving complex, autonomous systems, that have sensors and controllers.

In the case of an urban traffic system, the sensors would be closed-circuit TV cameras mounted on road gantries and other places while the controllers, or actuators, would be traffic lights, which can effectively start and stop the flow of traffic.

Currently, traffic lights either have fixed timer controls or a centralised, control system. The widely used Split, Cycle and Offset Optimisation Technique (SCOOT) is popular with those responsible for traffic control. It computes a single cycle time for all intersections, splits this cycle time into green times for each intersection and then adjusts offset times in order to minimise waiting times. SCOOT's primary aim is keep traffic flowing smoothly and pedestrians safe. Modern traffic-responsive Urban Control (TUC) additionally takes public transport into account.

However, although these systems have been developed over many years, they do have several technical shortcomings and traffic jams do occur more frequently than drivers would like because problems with flow control. Fixed timers are obviously flawed as they do not respond to traffic itself and even centralised systems cannot respond optimally to the changes in traffic movements out on the roads. This leads to jams and waste drivers' time, vehicle fuel, and to higher levels of localised pollution in towns and cities than might otherwise be present.

"The environmental and economic importance of traffic control systems combined with the distributed nature of traffic nodes and their constantly changing traffic demands make traffic light control an ideal test case for organic computing approaches," explains Prothmann.

He and his colleagues have now used the organic computing approach to develop a decentralised traffic control system and compared its impact on traffic flow with a conventional system. "The organic approach is based on industry-standard traffic light controllers," Prothmann explains. These have been adapted to have an observer/controller architecture that allows the traffic light to respond to traffic flow and to pass on information to the other traffic lights on neighbouring roads.

Tests at busy junctions in Hamburg, have demonstrated that the average number of vehicle stops can be cut significantly, delays avoided, and journey times reduced, all of which has benefits for drivers, pedestrians and city dwellers, and, in terms of fuel use and pollution, the environment.

More information: "Organic traffic light control for urban road networks" in Int. J. Autonomous and Adaptive Communications Systems, 2009, 2, 203-225

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