New approach to data reduction for intelligent transportation systems

February 29 2016, by Diane Kukich

Intelligent transportation systems enable people to make smart travel choices, whether it's selecting an alternate route to avoid a minor traffic backup or figuring out the safest evacuation path during a hurricane.

But massive amounts of data are challenging the ability of these systems to provide accurate, real-time information to users.

"We now have new data streams about traffic dynamics such as vehicle speed, the number of vehicles, the location of accidents, and so on, resulting in huge amounts of connected data," says Lena Mashayekhy, assistant professor of computer science at the University of Delaware.

A research team that includes Mashayekhy, along with other academic researchers and a senior technical leader from Ford Motor Company, has come up with a way to reduce that data so that it can be used in intelligent transportation systems (ITS) applications.

Their work has been published as a paper, "Hierarchical Time-Dependent Shortest Path Algorithms for Vehicle Routing Under ITS," in the February issue of *IIE Transactions*, and it also has been selected as a January 2016 featured article in Industrial Engineer magazine.

Known as HTGD (hierarchical time-dependent goal directed), the approach involves identifying similar "communities" in the traffic data and then finding the shortest route at the highest level, effectively reducing the search space by eliminating entire communities that would

not be traversed by the optimal path.

"Our method strikes a good balance between efficiency, or search cost, and effectiveness, or path optimality," Mashayekhy says.

"We believe that the significant reduction in memory requirements of HTGD compared with those of other current methods makes it suitable to be incorporated into vehicle routing navigation systems. It will be especially valuable for determining which routes are available—and which are not—in routing emergency vehicles and organizing natural disaster evacuations."

Extensive experimental evaluations of the proposed approach on Detroit, New York, and San Francisco road networks have demonstrated the computational efficiency and accuracy of the proposed method.

More information: Mark Mahyar Nejad et al. Hierarchical time-dependent shortest path algorithms for vehicle routing under ITS, *IIE Transactions* (2015). DOI: 10.1080/0740817X.2015.1078523

Provided by University of Delaware