Smart satnav drives around the blue highway blues

February 7 2013

Endlessly frustrated by congested roads, computer scientists at California State University, in Fullerton have developed a satellite navigation system, GeoTNavi, which hooks into historical traffic data and current vehicle movements to find the shortest commute and avoid the traffic jams.

Writing in the latest issue of the *International Journal of Data Mining, Modelling and Management*, Shawn Wang and colleagues explain how the California highway system is one of the most complicated and busiest highway systems in the USA with well over 83% of urban interstate congestion. Not without irony, they point out that traffic jams and unpredictable communication delays are not unique to US cities. A satellite navigation system that could drive around jams and avoid gridlock would be a boon to commuters, truckers, public transportation, emergency services and logistics organizations the world over.

They point out that "sat-nav" systems have built-in updateable maps, while some are linked to web-based mapping services. There also exist services that monitor traffic flow and alert drivers to potential trouble often based on calls from drivers to local radio news and road authorities depending on where you are in the world, while some systems have automated reporting from a select group of sat-nav users. There is a third source of information based on historical traffic movement databases. The team has now brought these various pieces of traffic information - maps, historical data and real-time driving conditions - together in a prototype system that could see an end to traffic jams.

The system works like a standard sat-nav in the first instance, but with the added benefit of not only calculating the driver's route from A to B but also basing its choice of highways on the time of travel and the historical data. The system can thus take the driver from A to B via C if necessary. The system also monitors the real-time traffic data and continuously assesses the route so that if there's a traffic jam, accident or other incident on the road from A to B it can take you via D and also avoid the gridlock at D. The team says their use of state-of-the-art data warehousing and data mining techniques makes this a very fast and efficient process.

"The GeoTNavi system is unique in that it takes the time dimension into consideration and uses real traffic data," the team explains. The team has tested their system against the two standard algorithms used by sat-nav route planners, Dijkstra and A*. Those two systems do not have the real-time or historical traffic inputs, of course. They used twenty weeks of historical data in the GeoTNavi route planning and set off across Los Angeles and Orange County on a Wednesday morning at 9 am, finding routes from A to B, from A to E and even A to Z. In all, tests were run on 10 randomly selected destination addresses. The conventional systems worked well for distances less than 10 miles, but once the route was 20, 30 or more miles, both degraded quickly in terms of finding the best route given congestion and traffic jam problems.

If every driver were able to choose the optimal route then ultimately the transportation network would reach an ideal equilibrium of zero congestion. The team points out that California is miles and miles from such an equilibrium, but GeoTNavi once optimized might help it approach such a state.

More information: "GeoTNavi – smart navigation using geo-temporal traffic information" in Int. J. Data Mining, Modelling and Management, 2013, 5, 20-36