MOUNTAIN-PLAINS CONSORTIUM

PROJECT BRIEF | March 2015

Real-Time Traffic Management to Maximize Throughput of Automated Vehicles

Photo: Ford

the ISSUE

To increase capacity and efficiency of U.S. highways and interstates, common maneuvers by automated vehicles such as lane changing, exiting, and merging should be accomplished to maximize throughput and reduce, if not eliminate, accidents.

the RESEARCH

Given an arbitrary number of automated vehicles, the researchers designed an algorithm to maximize the number of possible lane changes on an arbitrary segment of a highway at any given time. The proposed algorithm utilizes information such as vehicles' positions, speeds, and time slacks to make judicious lane change decisions without requiring prior knowledge of traffic patterns or unnecessary braking. To reduce runtime overhead, we propose a distributed approach to allow for local lane-changing decisions to be made during run time.

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A University Transportation Center sponsored by the U.S. Department of Transportation serving the Mountain-Plains Region. Consortium members:

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South Dakota State University
University of Colorado Denver
University of Denver
University of Utah
Utah State University
University of Wyoming

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Project Title

Real-Time Traffice Management to Maximize Throughput of Automated Vehicles

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the **FINDINGS**

This report discussed the problem of lane change maximization of automated vehicles to minimize the disruption of traffic flow caused by lane changes. A distributed algorithm was proposed to solve the problem. The key ideas behind said algorithm are time slack calculations and the concept of vehicle grouping. Simulation results show that the proposed method increases the number of lane changes by up to 109–2454% and 68–1386% on average compared to a number of baseline algorithms.

the **IMPACT**

This work has raised several important questions. First, a mixed system consisting of automated and manual vehicles should be considered. Second, the urgency of a vehicle that wishes to change lane in order to further minimize the disruption of traffic flow should be considered. For instance, a vehicle needing to take an exit should be given a higher priority. Finally, while it is helpful to maximize the number of lane changes to alleviate its disruptive effects on traffic flow, the problem of deciding whether an automated vehicle should change lane in order to maximize throughput needs to be studied.

For more information on this project, download the entire report at http://www.ugpti.org/resources/reports/details.php?id=778

For more information or additional copies, visit the Web site at www.mountain-plains.org, call (701) 231-7938 or write to Mountain-Plains Consortium, Upper Great Plains Transportation Institute, North Dakota State University, Dept. 2880, PO Box 6050, Fargo, ND 58108-6050.