SJSU SAN JOSÉ STATE UNIVERSITY
MTI REPORT 1701
May 2018

Exploring Strategies to Improve Mobility and Safety on Roadway Segments in Urban Areas

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This research investigated driver compliance rate (CR) with STOP-signs at All-Way STOP Control (AWSC) intersections that are in close proximity to upstream or downstream signalized intersections. Also, strategies to improve mobility and throughput on segments in an urban area were explored via modeling and simulation.

Study Methods

Thirty isolated segments with combinations of signalized and un-signalized intersections in the District of Columbia were selected for the study. Field data (traffic volumes, signal timing, lane configurations, etc.) were collected at each intersection of the segments. Driver compliance with STOP-signs at AWSC intersections within the segments was also observed. In all, 13,956 observations were made at 57 AWSC intersections. The segments were then modelled in the software program, and two scenarios were simulated. The "before" scenario simulated the existing conditions on the segments. In the "after" scenario, the AWSC intersections in each segment were signalized (and optimized), while maintaining the same conditions at the signalized intersections. Control delay and average travel speed were the measures of effectiveness (MOEs) that were used to assess the performance of the segments in both scenarios.

Findings

Lower CRs were observed at AWSC intersections that were in closer proximity to the signalized intersections.

Thus, the shorter the distance between the existing AWSC to signalized intersections, the lower was the CR (or the higher was the violation rate). The results of a regression analysis showed a positive relationship between CR and the distance. The regression model developed indicates that, to achieve a minimum compliance rate of 95%, a minimum distance of approximately 1,298 ft. between the intersections is required.

There was a significant improvements in control delay in the "after" scenarios compared to the "before" scenarios.

Also, a test of comparison of means of the segments' MOEs in the "before" and "after" scenarios showed significant improvements in the "after" scenarios. Statistically significant reductions in control delays on the segments were reported, while the average travel speed of vehicles significantly increased.

Policy Recommendations

Based on the regression model developed, to achieve a minimum compliance rate of 95% at STOP signs, a minimum distance of approximately 1,300 ft between an AWSC intersection and an upstream or downstream signalized intersections is recommended. Also, even though some unsignalized intersections may not meet the MUTCD warrants for signalization, signalizing and coordinating them with existing signalized intersections will improve mobility and throughput.

About the Authors

Dr. Arhin is an Associate Professor of the Department of Civil and Environmental Engineering of Howard University, the director of the Howard University Transportation Research and Traffic Safety Data Center (HUTRC), and the director of this transit research project, conducted under the Mineta Consortium for Transportation Mobility.

To Learn More

For more details about the study, download the full report at: transweb.sjsu.edu/project/1701

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