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System for Dilemma Zone Mitigation at Signalized Intersections

Wireless system preventing red light violations by predicting trajectories of heavy vehicles.

Researchers at Purdue University have developed a new system to help manage signalized intersections and mitigate risk associated with running red lights. There remains an unmet need to prevent vehicles from incidentally traversing intersections, especially for heavy vehicles that are twice as likely to violate a red light. Each year over 2 million crashes occur at signalized intersections, with hundreds of thousands and injuries and over 3,000 fatalities. In addition, heavy vehicles lead to a fatality rate in crashes that is five times higher than that of passenger vehicles. Traditional technologies typically extend a green light signal to enable passenger cars to save time; however, this requires expensive infrastructure. The method created by Purdue researchers features a wireless communication network with devices both located at the traffic signals and in vehicles. Vehicles are identified by the traffic signal as they arrive at an intersection. The system calculates the trajectory of a vehicle reaching the signal, and via embedded intelligence the system can change either extend green or indicate yellow early to ensure the vehicle has ample time to stop. A prototype has been developed and field-tested at a live intersection â€“ the system was able to detect vehicles traveling 55 miles per hour (mph) in a 6 ft waypoint radius spaced 50 ft apart with 95% accuracy and a 5% lag threshold of 0.59 seconds. Using data to estimate, dilemma zone incursions can be reduced by 34% at the test intersection.

Advantages:

-Can Improve Safety and Reduces Driver Wait Time

-Can Prevent Vehicle Incursions

-Can Improve Signal Efficiency and Early Yellow Warning

-Can Alert Driver to Traffic Light Status

-Wireless, Eliminating Need for Intrusive Infrastructure

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Automotive & Mobility
Tech/Mobility AI & Embedded Intelligence Systems

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Potential Application:

-Traffic Signal Management

-Connected and Autonomous Vehicles

-Connected Infrastructure

-Smart Cities and Urban Mobility

Technology Validation:

A prototype has been developed and field-tested successfully in Indiana. Awarded nationally for best paper for implementable research by the Transportation Research Board Traffic Signal Systems Committee in 2020.

Recent Publication:

"Using Connected Vehicle Data to Reassess Dilemma Zone Performance of Heavy Vehicles"

The National Academies of Sciences, Engineering, and Medicine

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Intellectual Property:

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