UNIVERSITY TRANSPORTATION CENTER

RESEARCH BRIEF

PROJECT TITLE: **Freeway Traffic Safety and Efficiency Enhancement through Adaptive Roadway Lighting and Control Enabled by Connected Sensor and Infrastructure Networks**

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INSTITUTION: MULTI-INSTITUTION PROJECT
ESTIMATED COMPLETION DATE: JANUARY 2018
SPONSORS: THE PACIFIC NORTHWEST TRANSPORTATION CONSORTIUM, WSDOT, ODOT

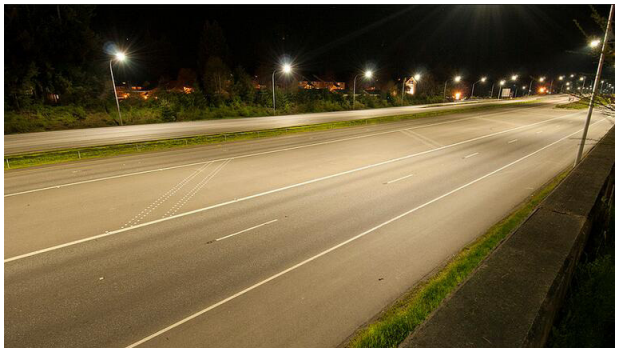
Background

Roadway safety and efficiency are adversely affected by bad weather conditions and environmental factors such as inappropriate lighting, sun glare, etc. Recent studies have found that uniform roadway lighting does not necessarily make a roadway safer. Instead, adaptive lighting based on roadway, traffic, environmental, and weather conditions is likely to achieve better safety, efficiency, and energy conservation benefits than conventional lighting schemes. Although the benefits of combining adaptive lighting and active traffic management (a control strategy demonstrated effective in reducing crashes and enhancing vehicle throughput) may seem obvious, very little research has been done along this line.

The Federal Highway Administration (FHWA) is currently surveying ambient light levels on thousands of miles of public roadways as a basis for setting adaptive lighting level standards in the future. In a parallel initiative, FHWA is examining adaptive traffic signal technologies. Washington State Department of Transportation (WSDOT) is currently working on the Statewide LED Roadway Lighting Conversion and Removal Project and plans to install an adaptive lighting system (using the Acuity Brands' ROAM system) along seven miles of urban freeway through Olympia, the state capital city. This corridor offers a great opportunity to study how adaptive lighting and active traffic management/control may be combined to maximize safety and efficiency benefits. Thus, this project intends to investigate the potential safety and efficiency benefits that may be afforded through combined implementation of adaptive lighting and active traffic control strategies enabled by connected sensor and infrastructure networks.

Research Project

The objective of this project is to develop an adaptive roadway lighting methodology and a supporting simulation platform through which it can be tested. The methodology will consider multi-source data including roadside sensor outputs, weather data, roadway geometrics, and elevation data as inputs in order to determine an optimal lighting strategy, as well as active traffic management (ATM) strategies. Specifically, this project will conduct research to evaluate the feasibility and value of controlling the roadway lighting system based on site- and time-specific characteristics (i.e., weather, traffic, pavement marking conditions). Communication bandwidth offered by the ROAM (ROSS Open Antenna Management) system (produced by Acuity Brands) will be used for coordinating illumination from light to light, as well as provide for between lights and roadway users via their mobile devices. Existing data archived in the DRIVE Net system (e.g., traffic detector data, probe vehicle data, roadway safety data, etc.) can be used to calibrate a simulation platform that will allow experimentation with and testing of the methodology before putting it into practice. Such a connected system that combines adaptive lighting and active traffic control strategies is expected to significantly increase safety and efficiency.



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