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CONNECTED VEHICLE APPLICATIONS: ENVIRONMENT

The U.S. Department of Transportation has developed a number of connected vehicle environmental applications, including the Applications for the Environment Real-Time Information Synthesis (AERIS) research program applications and road weather applications. AERIS seeks to leverage connected vehicle technologies that have the potential to yield significant reductions in emissions and fuel consumption. Road weather applications assess the impact that weather has or will have on roadways and provide targeted and actionable guidance to mitigate those impacts.

This resource includes a brief description as well as a cross reference of materials for each connected vehicle environmental application. The end of this document provides detailed reference material information. For more information about each application, please visit the Connected Vehicle Reference Implementation Architecture website: http://www.iteris.com/cvria/html/applications/applications.html.

AERIS

Alternative Fuel Vehicle (AFV) Charging/Fueling Information: Informs travelers of locations and availability of AFV charging and fueling stations and inductive/resonance charging infrastructure, thereby alleviating "range anxiety."[4]

Connected Eco-Driving: Provides customized real-time driving advice so drivers can adjust their behavior to save fuel and reduce emissions.[1, 3, 5]

Dynamic Eco-Routing: Determines the most ecofriendly route, in terms of minimizing fuel consumption or emissions, for individual travelers.[4, 5, 6]

Eco-Approach and Departure at Signalized Intersections: Broadcasts an intersection traffic signal's current phase (red, yellow, or green) and the time remaining in that phase. These data are used by connected vehicles to support eco-friendly speed trajectories as vehicles approach and depart from a signalized intersection.[3, 5]

Eco-Cooperative Adaptive Cruise Control: Collects other vehicles' speed, acceleration, and location information and integrates this data into a vehicle's adaptive cruise control system. This data enables automated longitudinal control capabilities and vehicle platooning to reduce fuel consumption and emissions.[1, 5]

Eco-Integrated Corridor Management Decision Support System: Uses historical, real-time, and predictive traffic and environmental data on arterials, freeways, and transit systems to determine environmentally beneficial operational decisions.[4, 5, 6]

Eco-Lanes Management: Establishes parameters and defines the operations of dedicated eco-lanes (similar in principle to high-occupancy toll lanes) that are optimized for the environment.[1, 5]

Eco-Multimodal Real-Time Traveler Information: Collects and provides schedule information for alternate mode transportation providers (such as train, ferry, air, and bus), allowing the user to efficiently plan a trip.[1, 2, 5, 6, 7]

Eco-Ramp Metering: Collects traffic and environmental conditions data to determine the most environmentally efficient traffic signal operation and to manage the rate of entering vehicles at freeway on-ramps.[1, 5]

Eco-Smart Parking: Provides users with real-time parking location, availability, type, and price to reduce parking search times and emissions.[4, 5]

Eco-Speed Harmonization: Optimizes speed limits based on traffic conditions, weather information, greenhouse gas emissions, and criteria pollutant information in appropriate areas.[1, 5]

Eco-Traffic Signal Timing: Uses data collected wirelessly from vehicles and other sources to optimize the performance of traffic signals, thus reducing fuel consumption and emissions.[3, 5]

Eco-Traffic Signal Priority: Allows transit or freight vehicles to request signal priority when approaching a signalized intersection. The application then adjusts the signal timing to improve service for the vehicle. Priority decisions are optimized for the environment by considering vehicle type, passenger count, or adherence to schedule.[3, 5]

Eco-Traveler Information: Disseminates information to support transportation choices that reduce fuel consumption and emissions.[4, 7]

Electric Charging Stations Management: Exchanges information between vehicles and charging stations to manage the charging operation and customize it to vehicle needs.[5]

Low-Emissions Zone Management: Leverages connected vehicle technologies to enable the operation of low-emissions zones, which are geographic areas that seek to incentivize green transportation choices and deter more polluting vehicles from entering the zone.[2, 5]

Roadside Lighting: Alters roadside lighting levels based on the presence of vehicles; also gathers environmental data from vehicles and adjusts lighting based on adverse weather conditions such as fog, rain, or snow.[5]

Wireless Inductive/Resonance Charging: Uses magnetic fields embedded in the pavement to transmit electric currents between metal coils and wirelessly charge both stopped and moving electric vehicles.[3]

Road Weather

Enhanced Maintenance Decision Support System: Recommends treatment plans and weather response plans to maintenance personnel based on road-weather data collected from connected vehicles.[8, 9]

Weather Response Traffic Information: Uses connected vehicle and historic data to enhance the operation of variable speed limit systems by providing appropriate speeds for current conditions.[8, 9]

Motorist Advisories and Warnings: Uses road-weather data collected from connected vehicles to warn drivers about deteriorating road and weather conditions on specific roadway segments.[8, 9]

Road Weather Information for Freight Carriers: Collects and uses road weather data from connected vehicles to develop short-term warnings or advisories that can be provided to individual commercial vehicles or to commercial vehicle dispatchers.[8, 9]

Road Weather Information for Maintenance and Fleet Management Systems: Collects data from maintenance vehicles and equipment and transmits this data to maintenance or fleet dispatchers to help monitor operation status.[8, 9]

Reference Materials

AERIS

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9. U.S. Department of Transportation, ITS Joint Program Office, SAE J2735 Standard: Applying the Systems Engineering Process, FHWA-JPO-13-046 (Washington, DC: 2013). Available at: http://ntl.bts.gov/lib/51000/51100/51167/DE156ECC.pdf

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