IntelliDrive℠
Safer. Smarter. Greener.

AERIS

ITS and IntelliDrive℠ for the Environment: Cars and Trucks

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This Discussion

Our foundational work has identified a number of ways in which ITS and IntelliDrive can improve environmental performance:

- Data that can characterize environmental performance
- Use of data to improve the operations of cars and trucks
- Strategies that allow improved operations of the transportation system

AERIS State-of-the-Practice Research

Research findings have been categorized into the following categories:

1. Traffic Management
2. Demand and Access Management
3. Logistics and Fleet Management
4. Navigation Systems and Traveler Information
5. Driver Behavior
6. Alternative Fuels and Alternative Fuel Vehicles

Some environmental benefits have been documented in these categories. AERIS will perform additional research in future tracks to identify candidate applications and strategies.

1. Traffic Management

Traffic Management includes the ability to analyze the current traffic conditions and dynamically make necessary adjustments to accommodate the different types of traffic or changing conditions

Example of Traffic Management strategies include:

- Traffic Signal Optimization / Coordination
- Adaptive Signal Control
- Ramp Metering
- Speed Management / Harmonization
- Incident Management
- Truck Signal Priority

Preliminary Findings:

- Traffic Management strategies can reduce congestion / delay, providing environmental benefits
- Traffic signal optimization / coordination benefits have been well documented and have a high rate of return on investment

2. Demand and Access Management

Demand and Access Management is the application of strategies and policies to reduce travel demand (specifically that of single-occupancy private vehicles), or to redistribute this demand in space or in time

Examples of Demand and Access Management strategies include:

- Electronic Toll Collection Systems
- Congestion Pricing
- 'Mileage based' or 'Pay-as-you-drive' fees

Preliminary Findings:

- Demand management strategies have the potential to deliver better environmental outcomes and more prosperous and livable communities
- Policies can increase the cost of driving and lead people to seek alternative modes of transportation
- For greatest VMT reductions, a region should combine land-use policies, pricing strategies, and transit investments

3. Logistics and Fleet Management

Logistics and Fleet Management is the management of vehicle fleets including a range of functions, such as vehicle maintenance, vehicle telematics, driver management, speed management, trip planning, fuel management and health and safety management

Examples of Logistics and Fleet Management strategies include:

- Automated Vehicle Location (AVL) Systems
- Commercial Fleet Management Services
- Demand-Responsive Transit Systems
- Parking/Loading/Delivery Management
- Sharing of Data Across Organizations

Preliminary Findings:

- There are a wide range of commercial fleet management services available that reduce emissions, and at varying costs
- Improved logistics and fleet management can improve operational efficiency, providing environmental benefits
- Emerging data sharing concepts could increase productivity, reduce trips, and improve environmental performance.

4. Navigation Systems &Traveler Information

Navigation Systems strategies use a GPS navigation device to acquire position data to locate the user on a road in the unit's map database.

Traveler Information includes disseminating traffic, incident, environmental, or other related information to affected motorists.

Examples of Navigation Systems and Traveler Information strategies include:

- "Green" Enhanced Navigation Services
- Dynamic Routing Via Mobile Devices
- Eco-Trip Planning Tools

Preliminary Findings:

- Applications are available that provide drivers with Eco-driving routing options, which can reduce fuel consumption by up to 8%
- Navigation systems have been shown to decrease vehicle miles traveled up to 16%
- Applications do not passively reduce emissions, drivers must actively engage and follow provided directions in order to reduce emissions

5. Driver Behavior

Driver behavior can be an effective way to reduce fuel use and carbon dioxide emissions. Practicing moderate levels of Eco-Driving can reduce fuel use up to15%.

Examples of Driver Behavior strategies include:

- Eco-Driving Information
- Eco-Driving Assistance
- Advanced Driving Alert System (ADAS) for “Time-to-Red” (TTR)
- Adaptive Cruise Control (ACC)

Preliminary Findings:

- Eco-Driving Assistance Pilot Projects show potential to reduce emissions by 3%-15%
- Advanced Driving Alert System (ADAS) for “Time-to-Red” (TTR)
  - 12-14% reduction in fuel consumption (CA)
- Adaptive Cruise Control (ACC)
  - 10% reduction in fuel consumption (Southeast Michigan)

6. Alternative Fuels & Alternative Fuel Vehicles

Types of AFVs, as defined by the Energy Policy Act of 1992 and its amendments:

- Flexible Fuel Vehicles (FFVs)
- Natural Gas Vehicles
- Propane Vehicles
- Electric Vehicles
- Fuel Cell Vehicles
- Biodiesel

The use of alternative fuels can reduce emissions from 17 to 26%.

Reducing Emissions by Improving Operations

Improve flow of vehicles (cars, trucks, buses, trains) to minimize emissions

- Minimize accelerations (specially hard accelerations)
- Maximize optimal speeds (varies by emission)

Meet travel demand through lower emission modes

- Enhance transit, bike and pedestrian attractiveness to increase mode share
- Enhance economic competitiveness of rail over truck travel

Make full use of engine diagnostics and information to minimize vehicle emission rates under full range of operating conditions

Reduce the amount of travel by fossil fueled vehicles

Convergence/Divergence: Mobility and Environment

- AERIS must discover where Mobility and Environment can work together, and where they diverge, and the webinar participants can help
- The AERIS program must focus on apps/scenarios that provide maximum environmental benefits, even if reduced mobility is a result
- AERIS will quantify the environmental benefits from apps/scenarios derived to help mobility as well as to help environment
- This research will provide authoritative information on these benefits so that tradeoffs between mobility and environmental benefits can be understood

Convergence/Divergence: Mobility and Environment (cont.)

Improving mobility doesn't imply increased emissions or fuel consumption

- Most mobility applications can likely reduce emissions and fuel consumption (e.g., adaptive cruise control, truck signal priority, or drayage optimization)

BUT, emissions and fuel consumption can also be reduced by strategies that can negatively impact mobility or productivity:

- Charging motorists a fee to enter a restricted zone can severely impact mobility (London, Milan)
- Restricting heavy vehicles entry into the city center can reduce productivity (Prague)
- Dynamic route guidance based on fuel optimization may not be the best alternative for individual mobility

Broad Agency Announcement (BAA)

Purpose of Issuing BAA:

- Expand knowledge of and experience with implementation of ITS applications to improve environmental performance by leveraging partners' research results and investments

BAA Objectives:

- Foster innovative research on ITS applications that improve environmental performance, and possibly develop new applications
- Promote capture and management of real-time data that are relevant to environmental applications development and performance measurement
- Support development and enhancement of evaluation techniques, performance measurement, and technologies to capture environmentally-relevant data

Broad Agency Announcement – Awardees

1. ECO-ITS | University of California – Riverside (UCR)
2. Developing IntelliDrive Eco-Adaptive Signalized Intersection Algorithms | Virginia Tech
3. Research on ITS Applications to Improve Environmental Performance | Mixon/Hill and the Texas Transportation Institute (TTI)
4. Engaging the International Community | University of California Partners for Advanced Transit and Highways (PATH) Program (UC Berkeley)
5. Developing and Evaluating Intelligent Eco-Drive Applications | Virginia Tech and SAIC
6. An Evaluation of Likely Environmental Benefits of Lowest Fuel Consumption Route Guidance in Buffalo-Niagara Metropolitan Area | University of Buffalo
7. Research on ITS Applications to Improve Environmental Performance | University of California – Riverside (UCR) and Calmar

Next Steps

Continue the State-of-the-Practice review:

- Document preliminary findings from literature search
- Conduct additional research and interviews

Build upon the new projects from the Broad Agency Announcement:

- Identify products and other opportunities to leverage research
- Improve the State-of-the-Practice findings based on results
- Develop and test prototypes to assess the potential of promising concepts

Identify and assess applications and strategies

- Assess individual applications
- Assess combinations of applications
- Examine deployment issues (e.g., costs, ease of implementation, market penetration, risks, stakeholders, policy considerations)

Contact

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