



Eco-ITS: Intelligent Transportation System Applications to Improve Environmental Performance

Project Overview

The University of California-Riverside's (UCR's) ECO-ITS program is aimed at developing and evaluating innovative applications, based on the use of advanced technologies, targeted at reducing energy and environmental impacts of vehicles and transportation systems. As part of this program, UCR researchers have developed new energy and emission modeling methodologies, applied these methods to analyze different ITS scenarios, and have also developed several ITS applications that are specifically targeted to reduce traffic energy consumption and emissions. Each of these applications has been shown to potentially reduce fuel consumption and emissions from vehicles. This project built upon previous research to synthesize results including: data collection methods; environmental analysis methods; integration of simulation and environmental modeling tools; and suggestions for environmental ITS applications.



University of California-Riverside (UCR)

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Data Collection and Modeling Methodologies

This project explored and developed a new method to estimate energy and emissions impacts from arterial roadways with traffic signals. This research has led to better energy/emissions assessments with results typically within 10% of the true values, compared to standard approaches, which are within 40% of actual values. In addition, the research team began developing new mesoscale speed-emissions curves for different hybrid electric vehicles to prepare models for the likely increase in hybrid electric vehicles in the future.

Integrated Traffic Simulation & Environment Modeling

The UCR team has developed a variety of techniques working with the CMEM model as well as MOVES. A summary is provided of the current efforts in this area. In addition, a summary is given of the latest ITS-based transportation models such as SUMO and how a similar energy/emissions estimation process can be applied. Finally, an eco-signal application has been advanced using these tools, showing that specific velocity planning algorithms can result in a 10% to 15% fuel economy improvement over a standard baseline case without the velocity planning.

Real-Time Vehicle Environmental Information

An innovative approach was developed to provide in-situ real-time environmental information estimates from vehicles. This system is called the Mobile Energy/Emissions Telematics System (MEETS) and has the potential to interact directly with the transportation infrastructure (e.g., traffic signals, ramp meters, etc.) for reducing energy and emissions. The system was validated using UCR's Eco-ITS test bed vehicle, showing very promising results.

Environmentally-Beneficial ITS Applications

In general, it is difficult to quantify the environmental and energy benefits of different ITS applications. By nature, when improving overall traffic efficiency, impacts on the environment are also reduced. It is also possible to specifically design ITS applications that have an intended environmental benefit. This project identified environmentally-beneficial ITS applications. These applications are categorized into three categories: 1) improvements at the *vehicle* level (i.e., Advanced Vehicle Control and Safety Systems); 2) improvements at the *system* level (i.e., Advanced Traffic Management Systems); and 3) improvements at the *behavioral* level (i.e., Advanced Traveler Information Systems).