

## AHMCT Overview

— extending the reach of Caltrans with technology, analysis, and communications —

The UC Davis Advanced Highway Maintenance and Construction Technology Research Center (AHMCT) extends the reach of Caltrans with technology, analysis, and communications. Over the past 15 years, AHMCT has delivered 16 concept vehicles and 18 major pieces of software and equipment that have made a difference in highway safety and efficiency.

AHMCT tests and evaluates new technologies, provides access to university and industry research, and trains students and professionals in transportation operations and technology.

In many cases, AHMCT innovations for Caltrans allow workers to stay in vehicles or behind safety barriers as they perform their work and to use special tools that make lifting, moving, cutting, filling, and clearing tasks easier and safer. AHMCT has also delivered robotic systems, sensors, and interfaces, and has provided innovations in GPS, GIS, communications, databases, materials, and hydraulics.

Professors Steven A. Velinsky and Bahram Ravani of the Department of Mechanical and Aeronautical Engineering direct the center.

Professor Velinsky's research interests include mechanical system analysis and design, and he has been involved in the mechanical system analysis and design of a wide variety of systems, including wire ropes and cables, vehicles, air bearings, ballscrew mechanisms, eye surgery, and automated highway maintenance and construction machinery.

Professor Ravani is a past Chair of the Mechanical and Aeronautical Engineering Department and is the current chair of the Department of Electrical and Computer Engineering. His research interests include kinematics and dynamics, advanced stress analysis and design, computer-aided design and computations, collision mechanics and biomechanics, forensic evaluation of accidents and trauma, and mechatronics and Intelligent Transportation Systems.

### Summary of Current AHMCT Projects

#### Employee Safety

Temporary Barrier Guidelines — Development of a web based toolbox for designing work zones.

New Mobile Barriers — Design of new mobile barrier.

Labor-Intensive Manual Tasks — Development of solutions to reduce injuries from performing manual tasks with a focus on herbicide application.

Multi-stack Traffic Cone Machine — Design and deployment of commercialized vehicles that reduce exposure in lane closures.

Human Assist Device for Lifting — Design of Omnidirectional Platform to aid performing manual tasks.

Balsi Beam Risk Assessment — Risk assessment of the Balsi Beam, a mobile safety barrier.

Applying Safety Improvements to Fleet — Application of safety improvements to fleet vehicles.

#### Planning and Operational Efficiency

GPS Automated Travel Diary — Design and production of a statewide travel survey tool, a hand-held device to record driver behaviors.

Bridge Profile Sensing System — Development of a system to collect clearance profiles at highway speed.

3D Laser Scanning for Surveying — Development of standards for 3D laser scanners.

Open-Source Software for Maintenance Operations — Identification and selection of components based on open standards, software, and hardware.

Vehicle Allocation Methodology — Development of a Department of General Services approved methodology for right sizing the fleets of all California agencies.

Business Cases — Development of business analyses of AHMCT projects.

Deployment Support — Support for cone, bridge, crack sealing projects after deployment.

#### Roadside

Vegetation Removal Tools — Development of concepts for vegetation removal that reduce use of herbicide and protect workers.

Roadside Inventory — Identification of best practices for asset tracking

Roadside Debris Removal — Identification of best practices for debris removal.

IHAS for Reduced Herbicide Vegetation Control — Development of a prototype vehicle for minimal application of herbicide

#### Roadway

Crack Sealing — Design and production of a prototype vehicle for longitudinal crack sealing.

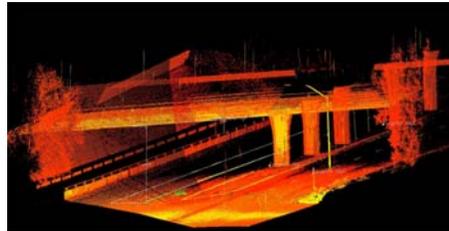
Markers and Stripes — Design, build, and test a Raised Pavement Marker vehicle

Pothole Hazard Mitigation — Develop and design system to repair pot holes from within a vehicle.

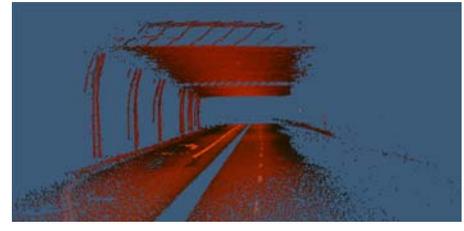
Roadway Debris Removal — Design and commercialization of a vehicle to remove roadway debris.



The Automated Cone Machine was developed and tested over several years, and the technology has led to a commercialized machine.



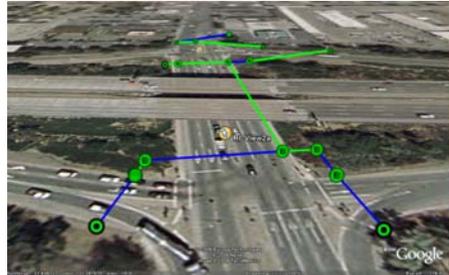
AHMCT researchers are developing 3D Laser Scanning standards and specifications that will enable large-scale deployment of this technology into Caltrans day-to-day survey operations.



To perform on-the-fly bridge profile sensing, a vehicle-based sensing system uses a scanning laser to measure range and reflected power from the bridge and the roadway.



The logitudinal crack sealer is a truck with a trailer based sealant transfer nurse kettle. It was developed for longitudinal-only, high-production hot applied sealing at continuous speed with no direct worker exposure to traffic.



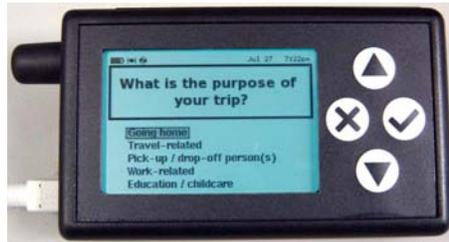
AHMCT is developing an Asset Management Tool for tracking roadside inventory. It will enable a user to easily locate roadside features, with Google Earth as the basis for the user interface.



The Debris Removal Vehicle has a long, grasping arm which can pick up litter bags and large debris.



An articulated nozzle fits on existing vacuum vehicles to make it possible to suck debris from the roadside and behind guardrails.



The Automated Travel Diary minimizes user burden during household travel surveys, while providing accurate, reliable, and spatially-dense traveler behavior information at a significantly reduced cost.



The Department of General Services recently encouraged all California agencies to use a vehicle allocation methodology developed by study conducted by AHMCT and Mercury Associates.



Three driver-guidance snowplows help Caltrans keep I-80 open despite extreme snow storms. Both GPS and roadway magnet guidance systems, along with radar systems and heads-up driver displays, have been developed by AHMCT.



The Random Crack Sealer reduces worker exposure to traffic and transforms the strenuous task of pavement sealing into a simple computer point and click process.