Workshop Overview

- July 16-18, 2013 at Stanford University
- 335 attendees from 14 countries
- Sponsored by TRB Committees on:
  - Vehicle-Highway Automation
  - Intelligent Transportation Systems
  - Vehicle User Characteristics
  - Emerging Technology Law
  - Transportation Energy
  - Cyber Security
  - Major Activity Center Circulation Systems
  - Emerging and Innovative Public Transportation and Technologies
Workshop attendance

<table>
<thead>
<tr>
<th>Organization Type</th>
<th>Attendees</th>
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<tbody>
<tr>
<td>Research Institutions</td>
<td>123</td>
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<tr>
<td>OEMs</td>
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<td>Automotive Suppliers</td>
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<tr>
<td>Consulting Firms</td>
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<tr>
<td>Other Industry</td>
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<td>Legal &amp; Insurance</td>
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<td>Public Sector</td>
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<td><strong>Total</strong></td>
<td><strong>335</strong></td>
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Breakout Discussion Topics

Identifying Research Needs in:

- Automated Commercial Vehicle Operations
- Infrastructure and Operations
- Cybersecurity and Resiliency
- Liability, Risk, and Insurance
- Data Ownership, Access, Protection, and Discovery
- Shared Mobility and Transit
- Testing, Certification, and Licensing
- Energy and Environment
- V2X Communications and Architecture
- Human Factors and Human-Machine Interaction
Automated Commercial Vehicle Operations

- Definition of commercial vehicle applications for automation and estimating their benefits
- Dynamic optimal truck platoon structures (how to sequence trucks in a platoon)
- Automated commercial vehicle training for drivers
Infrastructure and Operations

1. Traffic Management
   - Local vs. Centralized Control/Communication/Coordination (need for a broker)
   - Standardization/Optimization
   - Non-Recurring Information (feedback from crowd-sourcing input)

2. Value of Automation
   - Role of Private Sector
   - Role of Public Sector
   - Defining Goals & Business Model

3. Value of Connectivity
   - Application-specific Requirements
   - Core/Facility Requirements
   - Localized Corrections/Comm.

4. Mapping/Positioning
   - Precision (decimeter level)
   - Accuracy (lane position)
   - Real-Time Updates/Non-Recurring Information (feedback from crowd-sourcing input)
   - Standardization/Optimization

5. Operational Strategies
   - Detection of Bicyclists, Pedestrians and Non-Equipped Vehicles
   - Accommodation for Travelers with Disabilities

6. Managed Lanes
   - Compliance/Enforcement
   - Commercial Vehicles (early deployment, “low-hanging fruit”)
   - Policy (finance/pricing, social equity)
   - Strategy to Deploy/Convert Lanes

7. Impacts on Long-Term Planning
   - Population Distribution
   - Performance Metrics
   - Simulation Tools
   - Impacts on Investments

8. Infrastructure
   - Role & Capabilities
   - Traffic Control Devices and Highway Sensing Systems
   - Pavement Markings
   - Region-Specific Needs
Cyber-security and Resiliency

• Incorporating the hacker mentality into automated road vehicle cyber-security research
• Defining cyber-security resiliency frameworks for road vehicle automation and roadside infrastructure
Liability, Risk and Insurance
Data Ownership, Access, Protection and Discovery

- End-User Privacy Perception
- Privacy Notices at the Testing Stage
- Consumer Privacy Notices by Levels of Automation
- Automated Vehicle Data Disclosure
- Models for Handling Data Collected from Automated Vehicles
Shared Mobility and Transit

- Evaluate impacts of automated valet parking on land use and transportation demand
- Evaluate impacts of automated driving on mobility impaired travelers
- Develop technical basis for international legal framework for certifying automated vehicles
- Integrate automation and shared mobility into the urban fabric
- Define common performance measures for automated shared mobility services
- Estimate additional benefits from high automation on segregated guideways rather than in mixed traffic
- Assess implications of widespread use of SAE Level 5 automation for transportation planning and design
- Develop generic hazard analysis framework for automated transit systems
- Develop collision *avoidance* system for transit buses
Testing, Certification and Licensing

- How to identify relevant automation use cases
- Comparison of automated vehicle evaluation methods (test track, road and simulation tests)
- Incorporation of human responses into testing
- Potential for testing, certification and licensing requirements to become barriers to market entry
- Representing real-world environment and driving behavior to improve simulation fidelity
- Ethical dilemmas in pre-crash decision making
Energy and Environment

• Transportation Demand Effects—Passenger and Freight
• Vehicle Design Changes Facilitated by Automation
• Actions to Improve Environmental and Energy Impacts of Automated Vehicle Systems
V2X Communications and Architecture

- V2X as a Means to Virtually Extend Sensor Range and Coverage
- Models and Simulation of Benefits of V2X Integration in Vehicle Automation
- V2X Communications Quality of Service
Human Factors and Human-Machine Interactions

- Transfer of control from higher to lower automation levels
- Optimal communication of automated vehicle status information to user
- Understanding potential misuse and abuse of road vehicle automation
- Driver adjustability of automated driving
Next Steps

• Research Needs Statements (RNS) drafted by breakout session organizers
• RNS adopted by TRB committees (one or more) and entered into TRB online database
• Available for use and reference by all interested parties:
  – Public and private sector research sponsors
  – System developers and evaluators
  – University research groups and students
  – Individual researchers or entrepreneurs