Automated Vehicle Technology –
Creating the Framework for Implementation

Thursday, March 31, 2016
Automated Vehicles – An Umbrella Term
Automated Vehicles – Technologies Overview

**CAMERAS**
Stereo and infrared camera data helps avoid obstacles, identify road sign messages, and visualize lane markings.

**SOFTWARE**
On-board computers run advanced software to analyze data collected by sensors to make intelligent maneuvers and real-time route determination.

**RADAR**
Radar tracks nearby objects, which helps maintain the car’s distance from vehicles ahead and detect blind spot obstacles.

**LIDAR**
Light detection and ranging system generates a point cloud that gives the car a 360-degree view.

**DEDICATED SHORT RANGE COMMUNICATION**
Provides communication between vehicles (Vehicle to Vehicle - V2V) and between vehicles and the transportation infrastructure (Vehicle to Infrastructure – V2I). DSRC is expected to be utilized where existing Intelligent Transportation Systems (ITS) are already in place, such as urban areas, high volume limited access facilities, and managed lanes.
Connected Vehicles

Applications
• Safety Critical Warnings
• Mobility Enhancements
• Environmental Benefits
• 55+ specific applications/uses defined by USDOT

Data Gathering/ Information Exchange
• Vehicle-to-Infrastructure (V2I)
• Vehicle-to-Vehicle (V2V)
• Vehicle-to-Bike/Ped/Other (V2X)

Safety critical functions of the vehicle (steering/throttle) *not affected* (operator is in control at all times)
Connected Vehicles

Technology
• Dedicated Short Range Communications (DSRC) (5.9 GHz designated to transportation by FCC)
• Cellular network
• Satellite communications

Equipment
• All DSRC units are still in development (prototypes)
• Need to identify standards for product specifications
• Controllers are being upgraded to being ‘CV-ready’
Specific Applications FDOT has Developed and/or Integrated from USDOT into SunGuide

- Wrong Way Driver Detection and Alert
- Over-height Detection and Alert
- Emergency Braking
- Emergency Vehicle Alert
- Red Light Violation Warning
Levels of Automation (as defined by NHTSA)

- **0 – No Automation**, but advanced collision warnings, blind spot monitoring, etc.
- **1 – Function Specific**, such as adaptive cruise control or active lane centering (but not as same time)
- **2 – Combined Function**, such as adaptive cruise control and active lane centering working at same time (must still be actively engaged in operation of vehicle)
- **3 – Limited Self-Driving**, Driver is not expected to monitor vehicle movements for limited time in limited situations (driver operates vehicle during part(s) of trip)
- **4 – Full Self-Driving**, No human operator expected to control safety-critical functions of the vehicle

Autonomous Vehicles

Safety critical functions of the vehicle (steering/throttle) are affected without direct driver input
GM Announced ‘Super Cruise’ at ITS World Congress (2014)

Semi-automated driving technology and Vehicle-2-Vehicle (DSRC) communications
- 2017 Cadillac CTS

Hands free, feet free *(not mind free)* driving
- Highway cruising speeds
- Stop-and-go congestion

“Through technology and innovation, we will make driving safer.”
– Mary Barra, GM CEO
GM announced in January (2016) that they’ve invested $500M in ride-sharing startup Lyft.

Teaming to create a “network of on-demand autonomous vehicles.”

“We see the future of personal mobility as connected, seamless, and autonomous.”
– Dan Ammann, GM President
Models sold after October 2014 optional “Auto Pilot Hardware” (cameras and radar sensors), but software was not included at time of sale.

Approximately 70,000 Model S vehicles currently have Auto-Pilot capability.

Software 7.1 Update (1/10/2016):
- Auto-Pilot
- Auto-Steer (20-85 mph)
- Use turn signal to change lanes
- Auto-Summon on private property
AV Legislation

Thirteen states introduced legislation related to autonomous vehicles in 2015, up from 12 states in 2014, nine states and D.C. in 2013, and six states in 2012.

States with Enacted AV Legislation

LEDGEND
- Enacted
- Executive Order
- Failed

National Conference of State Legislatures 1/19/2016
F.S. 316.85 – Autonomous Vehicles; Operation

F.S. 316.86 – Operation of vehicles equipped with autonomous technology on roads for testing purposes; financial responsibility; exemption from liability for manufacturer when third party converts vehicle

Legislation was proposed by Senator Jeff Brandes in 2012, and passed in 2013.

Purpose was to provide some parameters to conduct testing, without being over regulated, so as to not stifle innovation.
The diagram illustrates the transition from traditional human-driven vehicles to autonomous vehicles, categorizing companies based on ownership of assets and level of autonomy.

- **Owned Autonomy**
  - **Today**
    - 100 yr. old model
    - No computer tech
  - **Shared Mobility**
    - Human driven; mobility on-demand via software

- **Autopia**
  - Autonomous PODS
  - On-demand public transport

The diagram shows a matrix with axes for Asset Owned vs. Asset Shared and Human Driven vs. Autonomous. Companies like Tesla, Mobileye, Delphi, Uber, and Lyft are positioned accordingly, indicating their current and future mobility strategies.
Rapidly Changing Business Models
• Requires new benefit/cost analysis to support deployment decisions
• Needs systematic & strategic approach

New Investments Needed
• Funding sources
• Infrastructure requirements
• Staffing needs

Data Issues
• Ownership
• Privacy/security
• Access & support

Interoperability
• Local, regional, national – multiple protocols
• Multi-jurisdictional testing and pilot agreements

Implementation Challenges of Automated Vehicles
Overcoming Barriers to Influence Transformational Technology

Public Sector Approach

Organization to Provide Leadership
- Automated Vehicle Initiative Steering Committee
- Stakeholder Working Groups
- University Research Partnerships
- Pilot Projects
- Public Outreach and Education

Innovative Culture is Mandatory

Private Sector Approach

Predictability in Meeting Requirements
Inclusion in Discussions
Opportunities to Demonstrate Success

Innovative Culture is Mandatory
Potential Effects of AV on Design Criteria

Lane Width
• Potential less lane widths required for AV only lanes
• For long life span projects (bridges/urban facilities) - combine small increases in paving now with reduced AV-only lane footprint for an extra lane in the future
• Dedicated lanes for freight/transit

Criteria that may become less of an issue
• Sight distances
• Road signs

Materials
• Materials may need to be updated to prevent ‘rutting’ if cars drive within >10 cm of lane center
• Markings may need changes for improved machine-read as opposed to human read
Potential Effects of AV on Urban Planning

Parking Space Size
• Reduced width (doors don’t need to open)
• Varied sizes to fit specific vehicle types

Parking Lot Location
• No spaces within 300’ of building entrances?
• On-street parking repurposed
• Passenger drop off/pick up lanes at building entrance (similar to airport design)
• Remote lots to make better use of urban land

Development Patterns
• Higher density requirements may be more attainable
• Driveway placement and design
• Building setbacks
• Greater focus on bike/ped improvements
Florida Developers Incorporating AV/CV Into Master Plans

Babcock Ranch (Charlotte County)

- Southwest Florida, near Fort Myers
- 50,000 residents x 28 Sq. Mi. = 1800 residents/ Sq. Mi.
- Seeking collaborators to develop and deploy a driverless-shared vehicle system
- Core Initiative – Transportation
  - Car Sharing
  - Bike Sharing
  - Mobility Services
  - Goods Delivery
  - Connected Vehicles + Homes
  - Autonomous Vehicles
Autonomous Intersection Management

Source: University of Texas
Florida Automated Vehicle Initiative
Steering Committee

- Develop a Strategic Plan
- Draft Design Standards for Major Infrastructure Investments
- Initiate additional testing facilities
- Form new non-traditional partnerships
- Prioritize investment locations
- Include AV/CV in all state planning documents
  - Long Range Transportation Plans
  - Strategic Highway Safety Plan
- Further enhance 2015/2016 accomplishments

FAV Steering Committee Members
Chair - Assistant Secretary Tom Byron (Intermodal Systems Development)
Assistant Secretary Brian Blanchard (Engineering & Operations)
Assistant Secretary Rachel Cone (Finance and Administration)
State Transportation Development Administrator – Jim Wood
District 7 Secretary – Paul Steinman
FTE Executive Director – Diane Gutierrez-Scaccetti
Manager of Transportation Statistics – Ed Hutchinson
Manager of TSM&O Office – Trey Tillander
FAV Stakeholder Working Group Chairs
  Dana Reiding (Policy)
  Ed Coven (Transit)
  Fred Heery (ITS)
Stakeholder Working Groups

Policies & Legal Issues

Infrastructure/Technology
- Roadway improvements
- Engineering & design standards
- Infrastructure investment

Modal Applications
- Transit
- Freight
- Inspections
University Research Partnerships

- Policy Implications for AV Technology – MPO LRTPs (UF)
- Simulator for Connected Vehicle Messaging (UCF)
- Autonomous Technologies for Mobility Solutions for the Aging and Disabled Populations (FSU)
- Visioning Future Cities with AV Technologies (FSU)
- Unmanned Aerial Vehicles (FIT) and Unmanned Surface Vessels (FAU) for Bridge Inspections
- AV Requirements for Service Vehicles (ERAU)

Universities in Florida have been conducting research on AV/CV/ITS technologies for >10 years
Existing Pilot Projects

Assessing Advanced Driver Assistance Systems in District 7 (Safety) – 75% complete

Assessing Connected Vehicle Technologies for Miami’s Perishable Freight Industry (Freight Mobility) – Phase I complete, Planning for Phase II
THEA/USDOT Project & Potential Pilot Projects

USDOT Connected Vehicle Deployment in District 7 with the Tampa Hillsborough Expressway Authority
  • Focused on reducing the frequency and severity of crashes (Safety)

Potential Pilot Projects (in planning):
  • Autonomous Attenuator Truck (Work Zone Safety)
  • Autonomous Low Speed Electric Shuttle for First/Last Mile Solutions (Mobility for Transportation Disadvantaged and Aging Populations)
Questions?

Email questions/comments to:
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