Emerging Vehicle Technologies

July 29, 2014

Derek Kuhn, QNX Software Systems
Where We Are Today

• Vehicles are incorporating Advanced Driver Assistance Systems (ADAS) technologies:
  – Collision avoidance
  – Lane departure warning
  – Automatic parking
  – In-vehicle navigation
  – Traffic sign recognition
  – Drowsiness detection

• ADAS and piloted drive are steps in the migration to fully autonomous driving
Infotainment and functional safety are merging at the platform level – there is engine control unit consolidation.

Systems must be reliable, but must also be capable of handling advanced graphics and multimedia.

The distinct needs of infotainment and functional safety need to be respected.
Industry Trends

• Expectations for the user experience are now set by smartphones and tablets
  – Connectivity
  – Apps
  – Personalization
  – Gestures

• This experience is now moving into a new medium - the automobile

“Consumer expectations of extending their digital lifestyles are accelerating the importance of the connected vehicle as the ultimate mobile device.”

Thilo Koslowski, Gartner, “Hype Cycle for Vehicle-Centric Information and Communication Technologies”, 2011
• How is the trend for smartphone features affecting the path to autonomous cars?
  – A faster development life cycle is expected
  – Telecommunications infrastructure is being upgraded to meet high connectivity demands
  – The need for public telematics and third party apps is growing
Challenges

• Despite increased software expectations, auto manufacturers are facing pressure to shrink development cycles.
Challenges

• A lot of processing power is needed to consolidate data from many sensors
• Securing data in the vehicle can be life safety-critical
• As connectivity features grow, so do the relationships with multiple stakeholders – OEMs, government, carriers, insurance
• Standards for inter-vehicle communication require OEM co-operation
“Building blocks in place” means vehicles have multiple cameras, RADARs, LIDARs or other communications technology, but they aren’t autonomous under the NHTSA level 4 definition.
Autonomous Cars

• Pursued by numerous groups
  – DARPA, Google/Stanford
  – Example with QNX Software Systems: VisLab/University of Parma

• News link: http://www.qnx.com/news/pr_5914_1.html
Autonomous Vehicles in California

29-July-2014

Bernard C. Soriano, Ph.D.
Deputy Director, California DMV
California At A Glance

- Approximately 38 million people
- Over 25 million driver licenses and identification cards
- Over 32 million actively registered vehicles
- Over 73% commute to work alone
- Over 172 thousand public road miles
- Over 323 billion vehicle miles travelled per year
- Variety of terrain and weather conditions
California Legislation – Senate Bill 1298

As soon as practicable, but no later than Jan. 1, 2015, DMV must adopt regulations setting forth requirements for:

• Manufacturers’ **testing** of autonomous vehicles on public roadways

• **Operation** of autonomous vehicles on public roadways
• Public workshops and meetings
  • Nissan
  • Chrysler
  • Honda
  • Volvo
  • GM
  • Google
  • VW Group
  • Toyota
  • Bosch

• Autonomous vehicle technology advancing quickly

• Adoption by the public will not be dependent on technology
  • Human factors (HMI)

• Potential traffic safety improvements are immense
  • Over 30,000 traffic fatalities per year
  • Almost all (95%) of traffic fatalities were the result of human error
  • In over 35% of traffic fatalities, the brakes were not applied

• Government and industry need to work collaboratively
NHTSA defines 4 levels of autonomous vehicles:

- Level 0 – No automation
- Level 1 – Function specific automation
- Level 2 – Combined function automation
- Level 3 – Limited self-driving automation
- Level 4 – Full self-driving automation

Society of Automotive Engineers (SAE) has similar definitions, although 5 levels.
Autonomous Vehicles in California
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• Philosophical differences
  • Driver is essential to vehicle operations
    • Design systems to maintain situational awareness
    • Adequate notification time
    • Human is the backup system
  • Vehicle operations fully autonomous
    • No need for steering or braking controls
    • Redundancy and fail-safe built into system

• Technological differences
  – Self-contained processing
  – Map dependency and cloud computing
  – Vehicle to vehicle communication (v2v)
    • NHTSA decision on DSRC capability
  – Vehicle to infrastructure communication (v2i)

• Other forms of autonomous vehicles
  • Platooning
  • Low speed shuttles
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• NHTSA Level 2 autonomous vehicles available now
  – 2014 Mercedes S class
  – 2014 BMW i3, 5-Series
  – 2014 Cadillac XTS

• NHTSA Level 3 autonomous vehicles being tested now
  – Private test tracks
  – Human reaction testing
  – Situational awareness

• No industry agreement on NHTSA Level 4 timetable
  – Dependence on DSRC?
  – Self-parking
Autonomous Vehicles in California

• **Volvo**
  
  No fatalities in a Volvo vehicle by the year 2020
  
  – Collision avoidance systems
  – Commercial trucking industry
  – Road train or platooning

  – Gothenburg, Sweden

• **Nissan**
  
  • Autonomous car will be available for sale before 2020
  • Price will be $1,000 - $2,000 above current prices

• **Audi A-7 demo at the 2013 CES**
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Challenges

- Definition
- Safety
- Liability
- Privacy
- Security
- Licensing
- Reliability
- Infrastructure
- Usage
- Vehicle Code
- Visibility
- Standardization
- Insurance
- Technical constraints
- Messaging
- Public perception
Autonomous Vehicles in California

Autonomous Vehicles
Statewide Steering Committee

– California State Transportation Agency
– California Department of Insurance
– California Highway Patrol
– California Office of Traffic Safety
– California Department of Transportation
– California Department of Motor Vehicles
– National Highway Traffic Safety Administration
Regulatory Package 1: Manufacturers’ Testing

- Two pre-notice workshops
- 45-day public comment period
- Formal public hearing
- 15-day public comment period
- Regulations approved and adopted in May 2014
- Effective on September 16, 2014
Testing Regulations Summary

- $5 million in insurance, bond, or self-insurance
- Test drivers: no DUI, not an at-fault driver, and no more than 1 point
- Successful completion of test driver training program
- Employee, contractor, or designee
- Seated in driver seat during testing
- Report any accident within 10 days
- Report unanticipated disengagement of autonomous technology
- Testing permit valid for one year
- Vehicles excluded from testing:
  - Commercial vehicles
  - > 10,000 lbs GVW
  - Motorcycles
Regulatory Package 2: Operation on California Public Roadways

- Contract with UC Berkeley for recommendations
- March 11 pre-notice workshop
- Available for 45-day public comment period shortly
- Formal public hearing

- Assignment of violations
- Definition of operator
- Operational and deployment restrictions
- Operator license requirements
- Other feasible regulations
- Target date of December 2014
Operational Regulations Summary (Draft)

- Expected to be available for public comment in July
- Public hearing after 45 days
- Specify if vehicle is capable of operating without a driver inside
- Disclose the designed areas of operation
- Submission of data from testing program
- Functional safety
- Sensor data recorded 30 sec prior to collision
- Disclosure of recorded data not necessary for safe operation of vehicle
- $5 million in bond, or self-insurance
- NHTSA Level 4 vehicles issued distinct special license plate
- No special driver license requirement
Outreach Efforts

- Meetings with manufacturers, suppliers, and industry
- Presentations to government and interested parties
- Social media
  - LinkedIn group
  - Reddit discussion
  - Facebook, Twitter, and YouTube
- California DMV website and blog
- Traditional media
- Industry meetings
- AAMVA information sharing group
Questions

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Autonomous Vehicle Information Sharing Group

Region I Conference
Toronto, Ontario

Cathie Curtis, AAMVA
Director Vehicle Programs
Impact On Motor Vehicle Administration and Law Enforcement

- AV’s will have impacts on governmental policies and regulations, roadway infrastructure, legal aspects and law enforcement, environmental factors, insurance coverage, driver's licenses and more

- Road safety and DMV Administrators, Policy makers, Law enforcement, insurance companies and others need to prepare for and accompany the emergence of this technology

- Important to create a group to share information as a starting point
• Formed Information Sharing Group Fall 2013

• Great response from AAMVA community, over 40 participants

• Different areas of expertise: Road safety and DMV Administrators, policy makers, program managers, law enforcement, industry
AAMVA Information Sharing Group

- **Chair**: Johanne St-Cyr, Vice-présidente à la sécurité routière, Société de l'assurance automobile du Québec

- **Vice Chair**: Bernard Soriano, Deputy Director, California Department of Motor Vehicles
• Information gathering and sharing
  – Discuss the different aspects and problems related to AV’s
  – Jurisdictions that have been working on AV’s can share their expertise
  – Presentations on different aspects of AV technology and their impacts
Created 3 subgroups - build a foundation on which the Information Sharing Group will focus their efforts over the next several months.

• Legal Analysis Subgroup - will provide an analysis of current laws that have addressed the regulation of autonomous vehicles.

• Framework Overview Subgroup - will identify and suggest aspects of autonomous vehicles that are of concern to the AAMVA community and that could be prioritized by the group.

• AV Information Library Subgroup - develop a resource for the AAMVA community on the AAMVA website.
• Accessible on the AAMVA website: http://www.aamva.org/Autonomous-Vehicle-Information-Library/

• Information on research and development, laws, policies, media, presentations and other general information on AV’s
Requested NHTSA funding for a smaller, more formal AAMVA working group to develop model legislation, regulations and best practices.

1. Manufacture testing/reporting
2. Operations of vehicles by general public
Next Steps

Regulation of Manufacturers by Jurisdictions

Regulations may address:

- Testing on public roadways
- Special Permits
- Operators of the test vehicles
- Maintaining records of testing
- Insurance/bonds
- Vehicles registered and titled
- And more
Next Steps

Regulation of the use of AV by General Public

• Training, testing, licensing of operators
• Registration/Title
• Insurance
• Driving while impaired
• Driving while distracted
• Privacy concerns
• Violations/Enforcement
• And more
Conclusion

• Many questions and challenges to come!

• AAMVA community must prepare for the emergence of AV’s in most aspects of our programs.

• AAMVA AV Working Group to help identify and define the issues and then develop best practices and model legislation for jurisdictions.
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