U.S. DOT Truck Platooning Research

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Beyond Traffic 2045
TRENDS AND CHOICES
Context: Automation in Beyond Traffic

Automation will have a potentially transformative impact across all transportation modes, increasing productivity, improving safety, and enhancing the capacity of existing infrastructure. It may also have a profound impact on the transportation workforce, changing the skills required to manage, operate, and maintain transportation vehicles and systems.
Automation Can Be a Tool for Solving Transportation Problems

- Improving safety
  - Reduce and mitigate crashes

- Increasing mobility and accessibility
  - Expand capacity of roadway infrastructure
  - Enhance traffic flow dynamics
  - More personal mobility options for disabled and aging population

- Reducing energy use and emissions
  - Aerodynamic “drafting”
  - Improve traffic flow dynamics

...but connectivity is critical to achieving the greatest benefits
Current L1 Connected Automation R&D

- Cooperative Adaptive Cruise Control (CACC) development
- Traffic Operations Applications
- Eco-Approach and Departure from Signals
- Truck Platooning
CACC Development Projects

- Enabling CACC High Performance Vehicle Streams
- CACC Field Tests
- OEM Assessment of CACC concepts and prototype
- Driver Acceptance of L1 Applications
Freeway Traffic Operations Applications

- Freeway Speed Harmonization
- Lane Change/Merge Operations
Eco GlidePath at Signalized Intersections

1. SPaT Data
2. I2V Communications: SPaT and GID Messages
3. V2V Communications: Basic Safety Messages
4. Vehicle Equipped with the Eco-Approach and Departure at Signalized Intersections Application (CACC capabilities optional)

Source: USDOT, November 2013
USDOT Truck Platooning Research

- Driver assistive truck platooning (DATP): two projects underway
- Concept: longitudinal control only; all drivers steer
- Combining V2V with radar
- Significant fuel savings through drag reduction
Research Objectives

- Define a commercially viable DATP system
  - Technical viability
  - Operational viability for fleet operations
- Assess DATP
  - Driver preferences
  - Energy savings
- Transition research results to industry
Caltrans/Volvo Project

- Three-truck platoon
- 5.9 GHz DSRC communication
- Longitudinal control only (throttle and brakes) driver, steers the truck
- Vehicles already equipped with production ACC
- Lead truck either manually or automatically (ACC) driven
- Gap is based on time headway – consistent with driver preference
I-710 Freight Corridor Concept

- A dedicated four-lane freight corridor parallel to the I-710 freeway is currently proposed
- 16-mile truck-only facility by 2025
Three Trucks Equipped for CACC

- ACC + DSRC + modified vehicle following control
- Supplementary Information Display for driver
Auburn/Peterbilt Project

- Two-truck platoon
- Business case analysis
- Vehicle and aerodynamics simulation/analysis
- Platoon formation modeling
- Traffic modeling
Phase I Results

- Business case analysis
  - ATRI survey; finding platoon partners
- Vehicle and aerodynamics simulation/analysis
  - Following vehicle sees large drag reduction, even at larger distances
- Traffic modeling
  - No delays; improvement at headways <1.25 / 60% penetration

http://eng.auburn.edu/~dmbevly/FHWA_AU_TRUCK_EAR/FHWA_AuburnDATP_Phase1FinalReport
Phase Two (Underway; Early 2016 Complete)

- **Testing**
  - Track; on-road; wireless performance
- **Aerodynamics**
  - Model refinement based on track test results
  - Effects of lateral offset by rear truck
  - Collecting data via “coast down” testing to further refine model
- **Platoon Formation**
  - Taking into account different fuel economy benefits for leader vs. follower
  - Examining protocols for platoon formation based on braking ability
- **Traffic Impacts**
  - Addressing entry/exit factors and non-interstate highways via simulation
State Roles in Truck Platooning

- Human-in-the-loop levels (L1/L2) ease the way for platooning
- State-level following distance laws are key:
  - 28 states have no minimum
  - 6 states are ready for pilot testing (UT, MI, NV, AL, TX, CA)
  - 7 states positioning for trials but early in process
- National associations involved to create model legislation
For More Information

http://www.dot.gov/

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