Automotive Driver Assistance Systems

David J. LeBlanc, Ph.D.
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Topics

- Vehicle-based crash avoidance systems
- Cooperative (connected) vehicles
Driver Assistance Systems

Forward crash avoidance
• Warning (FCW)
• Brake assist
• Auto-braking interventions (FCM)
• (Occupant protection pre-arming)

Adaptive cruise control
• ‘Conventional’ ACC
• Full speed range ACC

Lane drifts
• Warning (LDW)
• Lane-keeping assist
• Interventions

Lane changes
• Blind spot detection (BSD)
• Warning (LCW): adjacent, overtaking
• Interventions

Lane changes
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• Driver drowsiness detection
• Distraction management:
  • driver workload managers
  • Etc…

• Speed control assistants (ISA)

• Curve speed warning (CSW)
• Hazard zone indicators
• Etc…
Selected Issues for Vehicle-Based Systems

“IT”
- Diagnostics
- Fault tolerance

Consumer acceptance (sensors, algorithms)
- False and nuisance alerts
- Individual differences & preferences

And...
- Sensor costs
Integrated Vehicle-Based Safety Systems (IVBSS)

- A 4+ year effort to develop and field test integrated safety systems for passenger vehicles and heavy trucks
- Warnings for rear-end, lane change and road departure crashes (drift-off and curve-overspeed).
- One-year field test on public roads - determine system performance, safety benefits, and user acceptance.
Integrated Vehicle-Based Safety Systems (IVBSS)

U.S. Department of Transportation
Intelligent Transportation Systems
Joint Program Office

NHTSA
People Saving People
www.nhtsa.dot.gov

FMCSA
Federal Motor Carrier Safety Administration

VOLPE center

Visteon

UMTRI

EATON

HONDA
The power of dreams.

TAKATA

INTERNATIONAL

Battelle
The Business of Innovation

MDOT

Conway
IVBSS Timeline – Vehicle Deployment

Phase I – 30 months
- Nov 2005: Engineering Development Vehicles
- Nov 2006: Prototype Vehicles
- June 2008: Pilot Vehicles

Phase II – 27 months
- Nov 2008: Extended Pilot FOT
- Feb 2009: FOT Data Collection
- August 2010: FOT Data Collection
IVBSS: Lane Change Merge Example

- **Advisories:** Side mirror icons
- **Crash Alert:** Audible alert if host (SV) moves to change lanes
IVBSS: Light Vehicle Trips (3 months into testing)

Preliminary information based on cell modem data for trips ending before 8/6/2009 (12:00pm EST)

To date:
>64,000 miles
6,751 trips
Expected:
220,000 miles (passenger)

Data points denote end-of-trip locations.
Passenger Vehicles: Variation in Alert Rate by Driver

Alerts Per 100 Miles

Individual Driver IDs (Ordered by Alert Rate)

- CSW
- FCW
- LCM
- LDW/audible
- LDW/haptic

Preliminary information based on cell modem data for trips ending before 8/6/2009 (12.00pm EST)
Connected Vehicles: IntelliDrive℠

5.9 GHz
- low-latency, secure
- V2V
- V2I: Roadside
- Gov’t/OEMs

Cell & satellite
- Higher latency
- 3rd party networks

Backhaul: public, private components

USDOT graphic
Connected Vehicles: IntelliDrive℠

- USDOT-RITA: ITS Joint Program Office
- $60-70M/year (70% research)
- Vehicle-to-vehicle communication
  - DSRC 5.9 GHz: low time latency, secure
- Vehicle-to-infrastructure/device communication
  - DSRC
  - Cellular, 4G, etc…
- OEM work on technology & apps, Michigan testbed test, California cellular system test
- Business model for DSRC, government backhaul:TBD
Low-Latency Safety Applications
(5.9 GHz)

- Emergency Brake Light Warnings
- Forward Collision Warnings
- Intersection Collision Warnings and Movement Assistance
- Blind Spot and Lane Change Warnings
- Do Not Pass Warnings
- Control Loss Warnings
Mobility Applications

Vehicle data as “probe” data

- Traffic management
- Real-time traffic and weather information
- Roadway conditions information
- Emergency operations
Michigan Testbed: 55 DSRC Roadside Installations

- Proof of concept project (VII-Consortium*)
- In-vehicle signage
- Probe data collection
- Toll collection/payment
  - Virtual toll plaza in the POC

* UMTRI vehicles among test fleet
Other Interesting Developments

- Ford SYNC uptake rates
- Map databases: from static to dynamic to bootstrapped
- Driving data going online (teens, navigation systems, insurance, (gas tax?), fleet management systems)
- Vehicle sharing