Drowsy Driver Detection Research

Chris Monk
Human Factors/Engineering Integration
Vehicle Safety Research
NHTSA’s Driver Impairment Research and Programs

Distraction

Alcohol

Drowsiness

dadss
Driver Alcohol Detection System for Safety

www.nhtsa.gov
Drowsy Driver Data

- FARS data (all vehicles):
  - 2.4% of fatal crashes between 2008 and 2012 reported as involving a drowsy driver
  - In 2012, there were 829 fatalities that were reported to involve drowsy driving
  - Most recent data available
In-Vehicle Drowsiness Detection

- Accurately detecting states of drowsiness and fatigue in real-time is challenging
  - Physiological data approach
    - Brain activity (EEG), heart rate
  - Camera/sensor data approach
    - Eyelid closure analysis, yawning
    - NHTSA conducted research using eyelid detection (i.e., PERCLOS) in Heavy Trucks (2009; DOT HS 811-117)
  - Vehicle-based driver behavior data approach
    - Steering inputs, lane-keeping
    - Current NHTSA research
NHTSA’s Research on Detection

- NHTSA research is investigating the use of vehicle-based data to predict three types of impairment:
  - Alcohol
  - Drowsiness
  - Distraction

- Goal is to evaluate the potential to accurately detect these impairment states without additional detection sensors/technologies
Advanced Countermeasures for Multiple Impairment

- Overnight drives in the National Advanced Driving Simulator after being up all day
- Real-time algorithms, based on lane-keeping and steering behavior, successfully detected drowsiness six seconds before lane departures
- Published in 2014: DOT HS 811 886
Detection Technology Potential

- NHTSA’s research demonstrates the potential for using vehicle-based data to detect drowsiness
  - Distraction and Alcohol impairment states also can be detected

- Efficacy and practicality of other detection technology approaches are still unclear
  - Eyelid closure measures
  - Facial expression tracking
  - Physiological measures
Countermeasures: In-Vehicle Feedback

- Feedback to drivers once drowsiness state detected?
  - What kinds of feedback results in behavior change?

- Current NHTSA Research
  - Assess potential countermeasure for drowsy driving lane departures
  - Evaluate an initial proof of concept for the use of this system in the development of safety technologies such as driver feedback displays for drowsiness
Crash Avoidance Technologies

- Crash warnings are designed to draw the driver’s attention to the situation.
- They have the potential to help in a variety of situations, including for impaired drivers, be it distracted, drowsy, or otherwise inattentive.
- NHTSA has included Crash Warning systems into its New Car Assessment Program:
  - NHTSA's 5-Star Safety Ratings
- ANPRM published Aug. 18, 2014 for V2V, which would enable many more crash avoidance applications.
- Agency decision on automatic emergency braking (AEB) in the coming months.
Thank You For Your Attention