An Update on NHTSA's Ongoing Human Factors Research Activities

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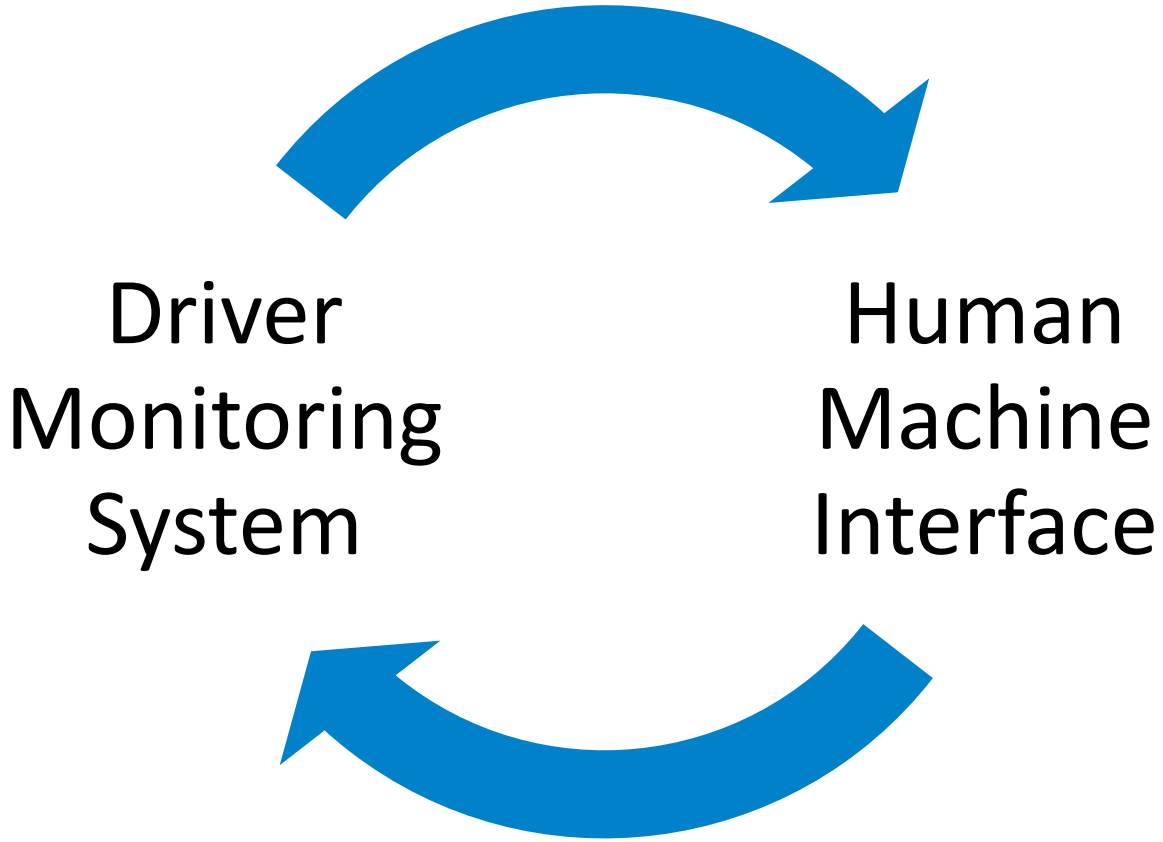
NHTSA
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

Hot topics



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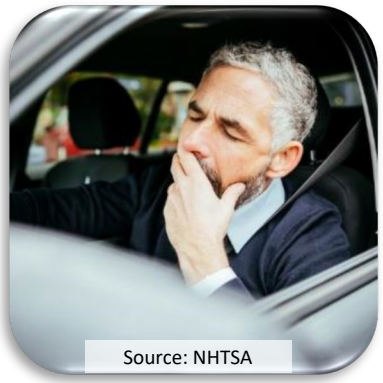

Detection

Driver Monitoring System

Human Machine Interface

Mitigation

Hot topics

Detection

Driver Monitoring System

Human Machine Interface

Propagation/Prevention

NHTSA Ongoing Research – DMS & HMI

Distraction

- Distraction: Voice Command Interfaces
- Distraction: Portable Electronic Device
- Novel Human-Machine Interface (HMI) Designs
- Examination of How the Duration of Secondary Task Engagement Changes Over Time in Lower Levels (L0 – L2) of Driving Automation

Drowsiness

- Examining Distraction and Driver Monitoring Systems to Improve Driver Safety
- Applied Research to Assess Drowsiness Detection

Alcohol Impairment

- Driver Alcohol Detection System for Safety (DADSS)
- Detection of Alcohol Impairment Signature in a Simulator
- Advanced Drunk Driving Prevention Technology Telltale Development

L2 Driver Engagement

- Field Data Collection with Consumer Available Driver Support Systems
- Driver Monitoring Strategies (DMS) in SAE L2 Driver Support Systems

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Distraction Research

- Visual-Manual NHTSA Driver Distraction Guidelines for In-Vehicle Electronic Devices (2013) provide recommendations and test procedures to interface developers to reduce distraction potential.
- In the years since then, we've seen:
  - Changes in **interface technology**: Increased use of touchscreens, voice control, smartphone integration, hardware/software improvements, etc.
  - Increased prevalence of **ADAS technologies**
  - New/improved **tools** to detect and measure distraction: Detection Response Task (DRT), EEG, etc.

Distraction Research

Voice Command Interfaces

Source: Kardome

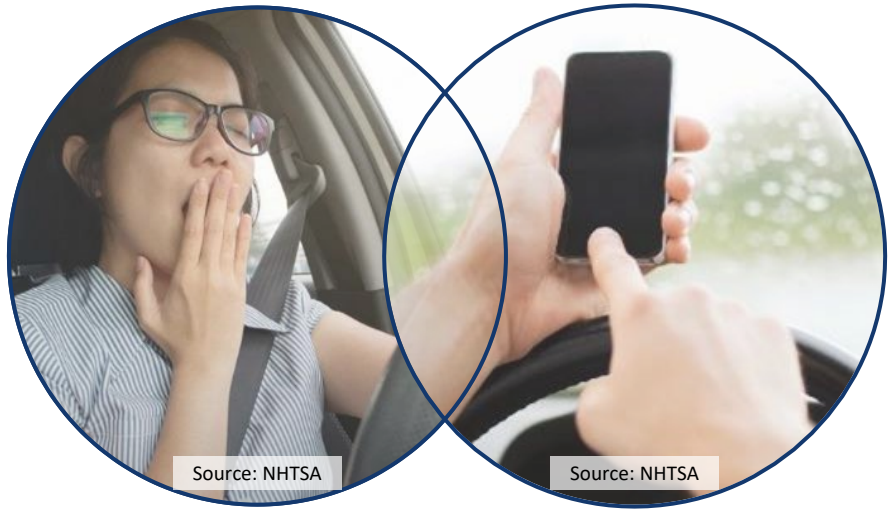
Portable Electronic Device Integration


Source: Insider

- What tasks are enabled by these HMIs?
- What are the impacts to cognitive workload, visual attention, & related psychometrics?
- What are the impacts to safety-relevant driver performance?

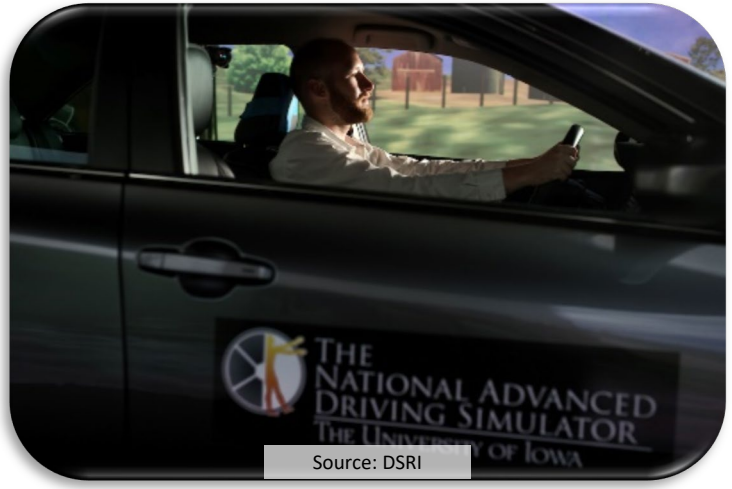
Examining Distraction and Driver Monitoring Systems to Improve Driver Safety

- What factors impact the ability of DMS to assess driver states?
  - Reliability to measure behavior
  - Construct validity to infer driver states
- Do reliability and construct validity change across different driver states that a DMS assesses?
- What is the impact of the DMS method, environmental factors?

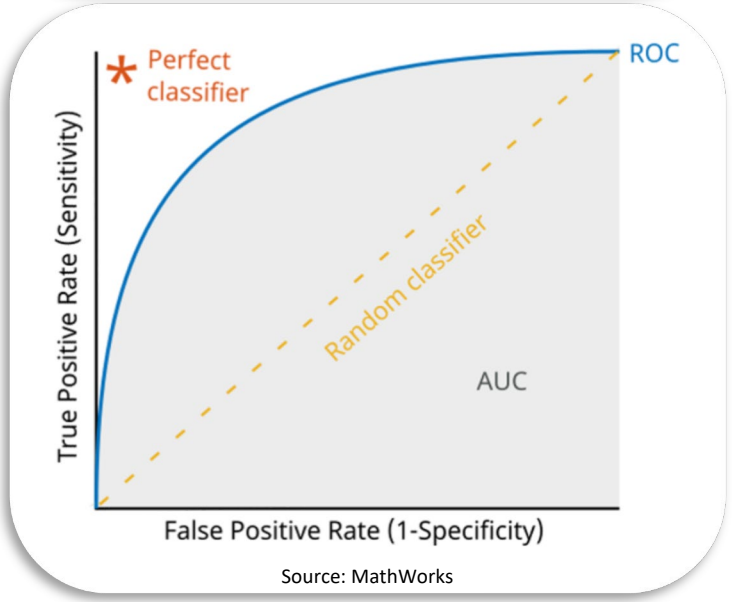


Examining Distraction and Driver Monitoring Systems to Improve Driver Safety

- Simulator study
- Induce driver states
  - Distraction
  - Drowsiness
  - Distraction while drowsy
- Capture direct and indirect DMS data
- Analysis to identify reliability and validity of various sensors to detect driver states
- Emphasize equity and ecological validity
  - Environment, driver, and task levels

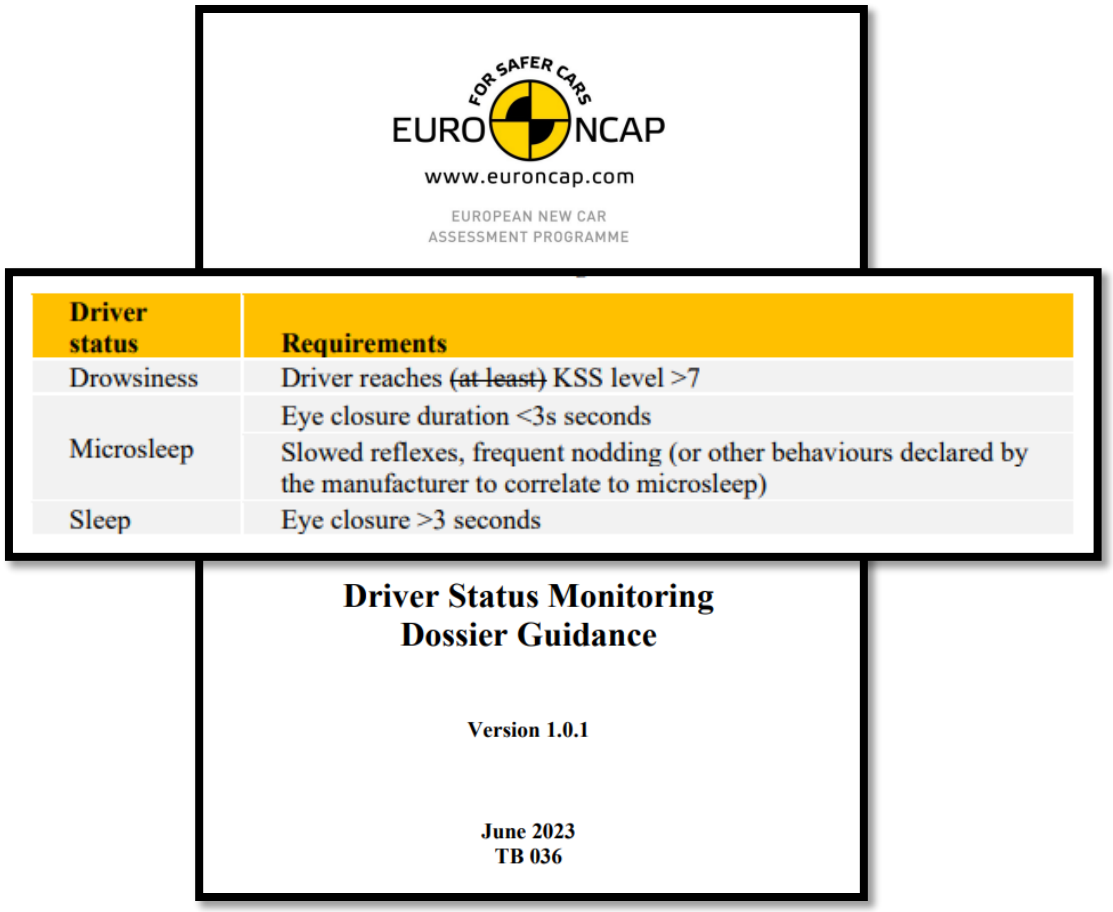


Source: DSRI



Source: MathWorks

Applied Research to Assess Drowsiness Detection



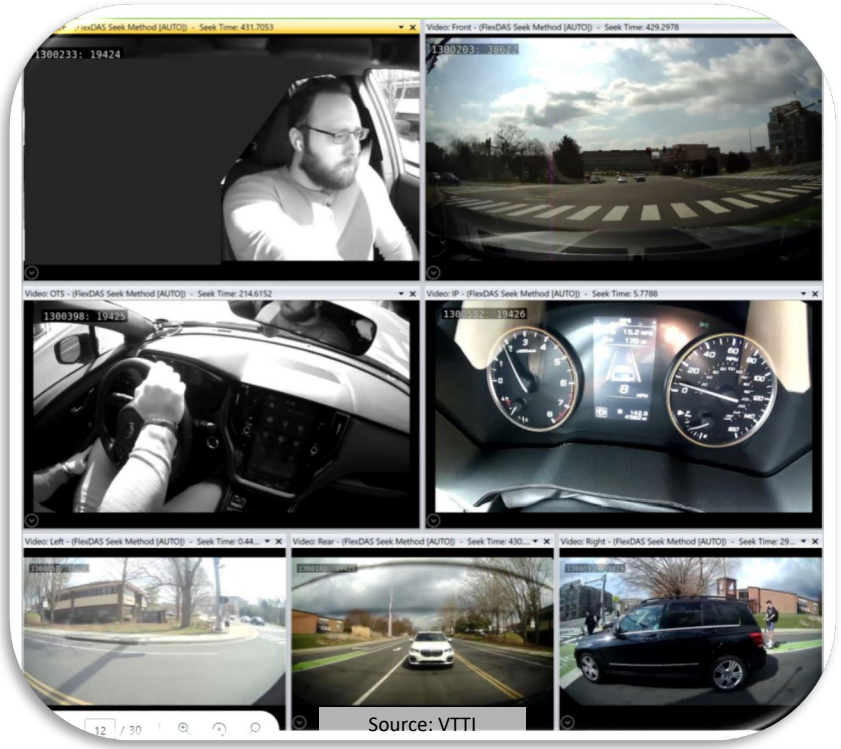
- Objective: Research to inform development of thorough, evidence-based procedures, protocols, and criteria for the testing of DMS to identify drowsiness
  - Literature and practice review
  - Development and refinement of a drowsy driver DMS test

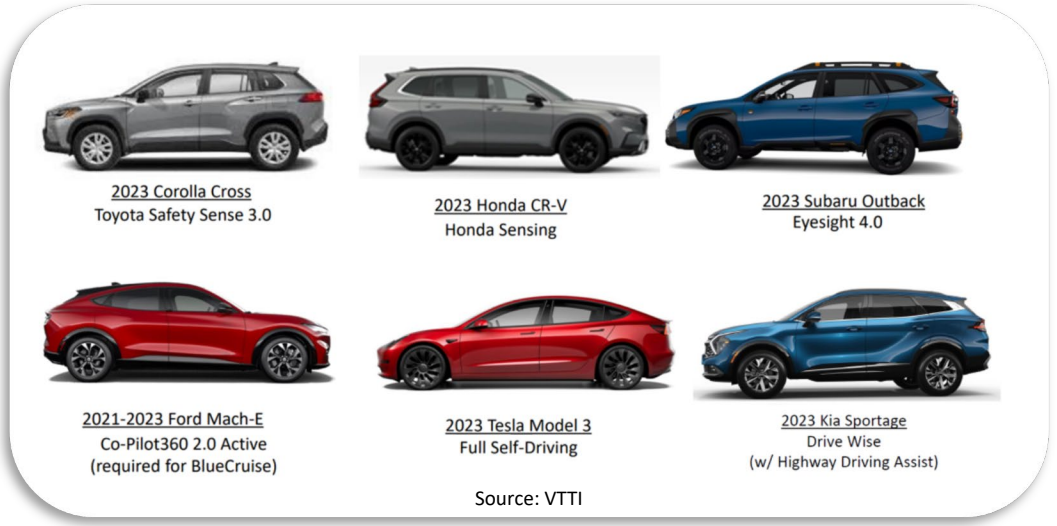
Applied Research to Assess Drowsiness Detection

- Key research considerations:
  - Indicators of drowsiness and their associated safety risks
  - Measures and criteria to identify onset and progression of drowsiness
  - Minimum level of drowsiness for mitigation/intervention
  - Methods to induce, replicate, synthesize drowsiness
  - Range of driver characteristics and environment conditions for testing
  - Drowsiness detection performance criteria

Field Data Collection with Consumer Available Driver Support Systems

- Collect long-term naturalistic data that examines how and when drivers use L2 systems
- 144 Participants across 3 sites, up to 18 months data collection period





Field Data Collection with Consumer Available Driver Support Systems

Objectives

- Equitable data access that protects participants
- Representative selection of L2 systems
- Diverse set of drivers with demographics and key self-report data
- Continuous, longitudinal assessment of L2-related driver behavior
- Continuous time-series data + comprehensive data dictionaries
- Standardized vehicle and environment factors
- Enriched data through analysis, external data fusion, data curation

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Contact Info

- Thank you
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