

Designing NAViSection:

Linked technologies enhancing driver capability reports and informing naturalistic driving studies

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Abstract: A novel methodology, NAViSection, integrates technologies to advance driver evaluation, training, and safety in testing sites where people work to obtain or retain a driver's license. The foundation for NAViSection links frameworks from rehabilitation engineering, occupational therapy, driver education, law enforcement, and traffic safety in order to capture the key determinants of driver capability. The system development took place in the context of the Adaptive Driving Program (ADP) within the Center for Assistive Technology at the University of Pittsburgh.

Features of the NAViSection system include automatic detection of steering and braking assistance by a Certified Driver Rehabilitation Specialist (CDRS) conducting a supervised driving evaluation. Additionally, the CDRS or driving evaluator logs moments where driving cues were spoken to a client during a driving session using a single button. These events do not directly relate to crash risk, so they are recorded as measures of cognitive assistance and momentary reflections of performance. In scenarios where a second evaluator or observer is present, manual data logging through a laptop computer keyboard interface adds contextual evidence of driving maneuvers and traffic laws to all events of interest described previously. Whether detected by automated or manual data logging routines, the NAViSection methodology and suite of technologies links CDRS assistance to in-vehicle data recorder evidence for consideration of intelligent transportation systems in the evaluation of driver capability. The framework for NAViSection presents an opportunity to incorporate driver assistance technologies and physiological monitoring sensors in review of driver impairment.



NAViSection System Layout:

- A-Steering Wheel Magnets,
- B-Wireless Steering Wheel Contact Sensor,
- C-Evaluator Brake Switch and Webcam,
- D-CDRS Event Logger,
- E-Data Acquisition and Receiver Unit,
- F-Event Recording and Witness Logger Program,
- G-DriveCap In-Vehicle Data Recorder

In partnership with Carnegie Mellon University, the NAViSection package was designed to provide tagging information to naturalistic driving data. The DriveCap data collection box is a low-cost, aftermarket in-vehicle system that can measure driver capability on common driving tasks in a wide range of vehicles. Results from implementation of NAViSection with DriveCap present the efficacy of the proposed technologies to automatically detect CDRS-assisted events. Associations from witnessed events to naturalistic driving data provide a source for data visualization to enhance findings and recommendations within reports from the ADP as well as client education and counseling.

As a work in progress, the NAViSection system will be expanded to further the automatic detection features, in-vehicle data recording channels, and data visualization modalities. The first implementation of NAViSection will be within the Adaptive Driving Program for enhancement of documentation from driving assessments. With future automatic detection of driving maneuvers in the form of a vehicle activity monitor, a future mode of NAViSection could link automatic detection features directly to in-vehicle data recording as an option for automotive companies to provide for driving schools and the mainstream market segment for home use.

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