Human Factors for Connected Vehicles Workshop: Planned Research and Guideline Development Activities

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ABSTRACT
The United States Department of Transportation's (USDOT) Connected Vehicle program includes a human factors research component (Human Factors for Connected Vehicles, or HFCV) that will examine ways to increase safety and reduce the frequency of crashes caused by driver distraction. A key outcome of the HFCV program will be a set of guidelines for the development of the driver-vehicle interfaces (DVIs) of Connected Vehicles. This workshop will provide an overview of the DOTs HFCV program, review key research studies underway to support the program, describe the process of developing design guidelines for the HFCV program, and identify opportunities for industry stakeholders to participate in the effort.

Categories and Subject Descriptors
H.5.2 [**User Interfaces**]: Standardization; H.5.2 [**User Interfaces**]: Style guides; H.5.2 [**User Interfaces**]: Graphical user interfaces (GUI)

General Terms
Human Factors

Keywords
Connected vehicles, Human factors guidelines, Integration

1. INTRODUCTION
Connected Vehicles (CV) is both a concept and a program that combines leading advanced technologies, including on-board computer, dedicated short range vehicle-to-vehicle communication, sensors, Global Positioning System (GPS) navigation, and smart infrastructure technologies. A goal of the Connected Vehicles effort is to identify threats, hazards, and delays on the roadway, and to provide drivers with alerts, warnings, and real time roadway information. A more complete description of the United States Department of Transportation's (USDOT) efforts in the Connected Vehicle area can be found at http://www.its.dot.gov/connected_vehicle/connected_vehicle.htm.

The stated goal of the human factors portion of this program is to *"ensure that the use of connected vehicles technologies do not introduce unforeseen or unintended safety problems"* (see also http://www.its.dot.gov/connected_vehicle/human_factors.htm). A key element of the human factors effort is a plan to produce guidelines to support the development of the driver-vehicle interfaces (DVIs) of Connected Vehicles. These guidelines will enable developers and manufacturers of DVIs to minimize the unintended consequences of such devices and ensure that they are constructed to be compatible with driver limitations and capabilities (i.e., safe for use in the vehicle).

2. GOAL OF THE WORKSHOP

The goal of the proposed workshop is to fully communicate the objective, research components, and guideline development activities of the HFCV program to the automotive research and design community, and to invite their feedback and participation in the effort.

3. TOPICS OF INTEREST

Expected participants would be individuals with experience and backgrounds in vehicle design, automotive safety, or human factors. The preferred number of participants would be 20-40.

Scheduled topics will include:

- Overview of the HFCV Program (NHTSA Staff)
- Presentations on a variety of HFCV research studies, including Crash Warning Interface Metrics (CWIM), DVI Design, and Integration
- Guideline Development Activities
- Group discussions or breakout groups on key topics (e.g., individual research areas, guideline development)

We would publicize the workshop with a website and through e-mails to critical individuals and groups (e.g., the SAE Safety and Human Factors Community). Reports from breakout groups would be documented and provided to NHTSA for future consideration.

4. ORGANIZER BIOGRAPHIES

John L. Campbell is a Research Leader at Battelle's Center for Human Performance and Safety (CHPS) in Seattle, Washington. Since joining Battelle in 1994, Dr. Campbell has been responsible for leading programs and conducting research in the area of transportation human factors and driver safety, with an emphasis on the design and evaluation of advanced driver information systems. In addition to his research and development responsibilities, he is the Director of the CHPS Human Performance Laboratory.

Christian M. Richard is a Principal Research Scientist at Battelle's Center for Human Performance and Safety (CHPS) in Seattle, Washington. Dr. Richard has formal training in human cognition, perception and attention, human aging, psychophysiology, research design, and statistics. He has been actively involved in empirical and analytical research activities in the area of human factors since 1999. Dr. Richard has served as principal investigator on human factors projects related to Highway safety and Pipeline Control Room safety, in addition to product design and evaluation for Automotive Industry clients. Dr. Richard also has extensive experience developing human factors guidelines for roadway systems, in-vehicle collision-avoidance systems, and in-vehicle "infotainment" systems. He has led several technical efforts involving conducting naturalistic driving data collection, literature reviews and investigating traffic-safety related human factors from the road-users perspective, including intersection safety, speeding behavior, vision/attention requirements in driving, driver distraction, and fitness to drive.

Monica G. Lichty is a Researcher in Battelle's Center for Human Performance and Safety (CHPS) in Seattle, Washington. Ms. Lichty has formal training in human factors analysis of products, websites, multimodal interfaces, and complex systems. Ms. Lichty has experience with all aspects of human factors guideline development including literature searches, research reviews, guideline development, and graphic generation. Recent efforts include guidelines for road weather information dissemination and road systems. She has led and contributed to technical activities including driving task analyses, focus group data collection and analysis, group data collection sessions, statistical analyses, and crash warning system DVI evaluations. Research topics for these activities include complex interchanges, roundabout navigation, naturalistic driving, and speeding.

James Jenness is a Senior Research Scientist in Westat's Transportation and Safety Research Group. He leads the Westat research team for NHTSA's Human Factors for Connected Vehicles program. This team is investigating a range of issues related DVI design and ways to minimize driver distraction and other unintended consequences. Many of Dr. Jenness' past projects have focused on the behavioral effects of introducing new in-vehicle and infrastructure-based technologies for drivers, motorcyclists, and pedestrians.

Neil Lerner is Manager of Human Factors for Westat's Transportation and Safety Research Group. Dr. Lerner leads a multi-organizational team for NHTSA's Crash Warning Interface Metrics (CWIM) program, which is developing evaluation protocols and design guidance for crash warning interfaces (specifically Forward Collision Warning and Lane Departure Warning). He has also led activities within the Connected Vehicle Program. In numerous past projects he has developed guidance for

driver interface, ITS displays, road systems, driver information systems, and others sorts of products.

Zachary Doerzaph is the leader of the Connected Vehicle Systems group at the Virginia Tech Transportation Institute (VTTI). Dr. Doerzaph has 10 years of experience in advanced safety systems and connected-vehicle projects. Notable projects for which he has served as a Principal Investigator include the Human Factors for Connected Vehicle Systems projects sponsored by NHTSA; the Safety Pilot Driver Clinics Supervisor and Model Deployment projects sponsored by the Collision Avoidance Metrics Partnership (CAMP); the Naturalistic Motorcycle Study sponsored by the Motorcycle Safety Foundation; and several data analysis projects utilizing VTTI's large-scale naturalistic driving data sets as well as numerous proprietary studies for OEMs testing and developing collision avoidance and semi-autonomous vehicles. In general, Dr. Doerzaph focuses his efforts on the design, development, and evaluation of advanced vehicle systems such as connected vehicles, collision avoidance, autonomous vehicles, and driver behavior monitoring systems. Dr. Doerzaph is knowledgeable in large-scale system integration and has considerable training and hands-on experience with vehicle design, data acquisition and integration, and large-scale database analysis.

Christian Jerome is a Research Psychologist in the Human Factors/Engineering Integration Division at the National Highway Traffic Safety Administration. He provides technical program, project, and task management, including monitoring technical and financial progress, for all HFCV projects. Dr. Jerome has co-authored many publications on traffic safety research topics including driver distraction, driver workload, age-related driving issues, and orienting attention to hazards or threats in the environment, many of which were presented at conferences and workshops.