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Editorial

Letter from the Editors

The *Journal of Safety Research* is pleased to publish in this special issue the proceedings of several papers presented at the 4th International Conference on Road Safety and Simulation convened at Roma Tre University in Rome, Italy, October 2013. This conference serves as an interdisciplinary forum for the exchange of ideas, methodologies, research, and applications aimed at improving road safety globally.

Conference proceedings provide the opportunity for research in its formative stages to be shared, allowing our readers to gain early insights in the type of work currently being conducted and for the researchers to receive valuable feedback to help inform ongoing activities. This conference in particular offers an array of research topics not often covered by this journal from researchers practicing in over 11 countries. As is common with publishing conference proceedings, the papers published in this issue did not go through the normal *JSR* review process. Each paper included in this issue did meet the Road Safety and Simulation conference review requirements. They reflect varying degrees of scientific rigor, methodological design, and groundbreaking application.

The proceedings published in this special issue of *JSR* draw from the following road safety research sectors represented at the conference: driving simulation, crash causality, naturalistic driving, and new research methods.

It is our hope that the publication of these important proceedings will stimulate vigorous dialogue, rigorous research, and continuing innovative initiatives and applications, leading, ultimately, to fewer traffic fatalities, injuries, and crashes.

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Driving simulator validation of driver behavior with limited safe vantage points for data collection in work zones

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ABSTRACT

Introduction: This study is aimed at validating a driving simulator (DS) for the study of driver behavior in work zones. A validation study requires field data collection. For studies conducted in highway work zones, the availability of safe vantage points for data collection at critical locations can be a significant challenge. A validation framework is therefore proposed in this paper, demonstrated using a fixed-based DS that addresses the issue by using a global positioning system (GPS). *Methods:* The validation of the DS was conducted using objective and subjective evaluations. The objective validation was divided into qualitative and quantitative evaluations. The DS was validated by comparing the results of simulation with the field data, which were collected using a GPS along the highway and video recordings at specific locations in a work zone. The constructed work zone scenario in the DS was subjectively evaluated with 46 participants. *Results:* The objective evaluation established the absolute and relative validity of the DS. The mean speeds from the DS data showed excellent agreement with the field data. The subjective evaluation indicated realistic driving experience by the participants. *Practical applications:* The use of GPS showed that continuous data collected along the highway can overcome the challenges of unavailability of safe vantage points especially at critical locations. Further, a validated DS can be used for examining driver behavior in complex situations by replicating realistic scenarios.

1. Introduction

The United States interstate highway system is more than 50 years old; the reconstruction, rehabilitation, maintenance, and preservation of this aging highway infrastructure require work zones. For effective planning and operation of work zones, work zone characteristics such as capacity, travel time, user cost and delay, queue length, and so forth require examination. Further, it is vital to understand driver behavior, especially in response to various work zone traffic control devices such as markings, portable changeable message signs, and driver compliance with speed limits (Bham, Mathur, Leu, & Vallati, 2010; Mohammadi & Bham, 2011; Bham, Leu, Venkat, and Mohammadi, 2014). To analyze work zone characteristics and to study driver behavior, field data are required. Field data collection requires safe vantage points at critical locations (e.g., an ideal location to analyze driver behavior is near a portable changeable message sign). In rural rolling and mountainous terrains (HCM, 2010), the availability of such locations is even more challenging as access can be very limited. Field data collection in work zones is complex and at times hazardous as it involves measurements under uncontrolled environmental, construction, and traffic conditions.

A driving simulator (DS) provides a safe environment to conduct studies in work zones (Bham, Mathur, Leu, & Vallati, 2010). DS studies have clear advantages over field data collection as they allow the study of driver behavior that may not be replicable in field tests for a wide range of scenarios including traffic control devices, state of traffic and composition, and the environment (Fairclough & Graham, 1999; Bham, Mathur, Leu, & Vallati, 2010). DS studies also permit the collection of various types of data, including driver attributes and their response to different stimuli, some of which cannot be collected in field studies.

For DS results to be representative of realistic conditions and thereby credible, they should be validated before they are used as a research tool. For validation of a DS, field data are required. Field data collection requires availability of safe vantage points, especially at critical locations, otherwise the validity can be limited to locations where data collection was possible and the rest of the simulated highway may not

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