

**Institute for
Transport Studies**
FACULTY OF ENVIRONMENT



UNIVERSITY OF LEEDS



University of Leeds
Driving Simulator



UNIVERSITY OF LEEDS **DRIVING SIMULATOR** INVESTIGATING DRIVER BEHAVIOUR IN A SAFE AND CONTROLLABLE RESEARCH ENVIRONMENT

The University of Leeds Driving Simulator (UoLDS) continues to be one of the most technically advanced driving simulators in use within a research environment in the world today, exploiting leading-edge motion base technology to create a high fidelity and dynamic simulated driving environment.

The simulator is developed and managed by a multidisciplinary group of academics from the Safety and Technology group at The Institute for Transport Studies. Using funding from UK and European government grants and private organisations, the group studies the interaction of drivers with new technologies, typically before they are fully implemented on roads and in the vehicle.

The team has over 20 years' experience developing cutting-edge, innovative scenarios suited to the needs of its funders. Realistic and repeatable scenarios allow studies on driver behaviour to be conducted in a safe and controllable environment, substantially reducing the costs associated with the development of real systems, infrastructures or prototypes.

Results from studies conducted on UoLDS have had substantial influence on National and International policy. For example, research on the simulator has shaped the understanding of how driver distraction affects road safety, providing guidelines for the implementation of speed advisory systems.

Other recent work has focused on the implementation of driver-friendly ecoDriving systems and human factors within automated vehicles.



Technical Details

Feature	Experimental Significance
<p>Launched in 2006, and using experience gained from an earlier driving simulator the current version consists of a Jaguar S-Type vehicle cab, with fully operational driver controls matching those found in a production car.</p>	<p>The realistic and familiar driving environment enhances the illusion that the participant is driving a real car.</p>
<p>Motors are connected to the pedals and the steering wheel to replicate the forces experienced through these controls during a drive.</p>	<p>The response of the motors can be manipulated allowing experiments into the tactile and haptic feedback provided to the driver through controls to be conducted.</p>
<p>A large Virtual Reality dome surrounds the vehicle. Nine HD quality projectors display the driver's eye view of the virtual world on the inside of the dome.</p>	<p>The HD resolution allows the simulator to be used to design new highway layouts and variable message signs.</p>
<p>The illusion of vehicle movement is created through an industry standard "hexapod" motion base, this being mounted on a world class X-Y table that can move the entire simulator up to five metres in any direction. This longitudinal and lateral movement provides users of the simulator with a more realistic perception of motion when compared with other driving simulators available in the UK.</p>	<p>The system has been used to help car companies improve the handling and feel of their vehicles. This is a competitive advantage for UK and EU companies and researchers.</p>
<p>The motion base can be tuned to allow the feel of road roughness or different road surface types (asphalt, ice, snow) to be felt by the driver as the car passes over them.</p>	<p>The simulator can be used to help design traffic calming measures such as speed bars and humps. It can also provide a unique experience when studying driver behaviour at higher levels of vehicle automation.</p>
<p>Eye tracking and other psychophysiological metrics can be used in the vehicle cab to continuously monitor the driver's viewing direction and measure driver physiological status.</p>	<p>This allows an understanding of driver state and provides knowledge on how different scenarios affect factors such as driver attention, stress and fatigue.</p>
<p>The simulator and its software continues to develop using in-house expertise, providing innovative design and scenario solutions for investigating the research questions relevant to today and tomorrow's road safety challenges.</p>	<p>In a research environment, where a wide range of studies are frequently undertaken, maintaining the ability to tailor virtual scenarios and experimental data collection to the exact requirements of a particular investigation is tremendously valuable.</p>





Research Opportunities

The simulator provides the opportunity to carry out research into areas such as driver behaviour, human machine interaction, driver situational awareness, vehicle handling characteristics and road layout/design.

UoLDS already has a twenty-year pedigree for executing high impact research projects, and is currently conducting research into questions around:

- Driver situational awareness when using automated vehicles
- Driver motorway lane change decision making processes
- Using simulation for virtual vehicle prototyping
- The effect of sleep apnoea on driver behaviour
- Driver distraction and response to critical events
- Development of driver friendly Ecodriver systems.

Institute for Transport Studies (ITS)

ITS is one of the world's leading interdisciplinary groups involved in teaching and research in transport studies and is the largest university-based transport teaching and research organisation in Europe.

UoLDS as part of the Safety and Technology group makes a significant contribution to the research undertaken within ITS and the importance of the simulator to the success of the group is recognised internally by the Institute and externally by our academic and industrial partners.

Further information

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