

The use of Virtual Reality in driving: VR driving simulators

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Usage of the Virtual Reality driving Simulators (VRDS)

The VRDS can mainly be used for the following cases:

- assessment and training of a “mean” driver.
- rehabilitation of the disabled driver.
- re-training and education of elderly people.

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VRDS additional capabilities

Additionally, a VRDS have the following potentials:

- To record objective scores for operational driving skills, such as reaction time, lane tracking, signaling, ability to read and obey road and speed signs, threat recognition, and crash avoidance.
- To give an opportunity to evaluate the client's reflexes.
- To provide a safe environment for evaluators to observe a client's ability to drive in various conditions.
- To give an opportunity for clients to practice driving and develop confidence before taking a road test.

Relevant Background - training driving simulators ...

- **AutoSim** enters European co-operation for development of Hydraulic Earth Excavator Training Simulator
The Simulated Hydraulic Excavator project, known by the acronym SHE, is an ESPRIT project involving industrial and research partners from France, Spain and Norway.
- **AIMS** Research has developed a training application development tool called SAFE-VR which allows PC-based VR training applications for hazard spotting, equipment operation etc. to be easily created, without any programming knowledge required.
- **University of Alberta** has worked with the DriVR virtual reality (VR) simulator system for driving assessment.
- Current studies, funded by the **National Institute on Disability and Rehabilitation Research (NIDRR)** are using a Virtual Reality (VR) Driving Simulator to examine driving abilities among individuals with traumatic brain injury and stroke.

... Relevant Background - training driving simulators ...

- [BEL](#) - Bharat Electronics Limited Training simulators (India)
- [Bundeswehr](#) - (German military forces) driving simulators
- [CGSD Corp](#) - Virtual Reality Driving Simulator
- [Doron Precision](#) - Various driving simulators since 1973.
- [FAAC DTS](#) - Various simulators (some pictures on DTS News page)
- [Faros](#) - Various training simulators.
- [Dr. Ing. Reiner Foerst Gmbh](#) - Various driving simulators.
- [DriveSafety](#) - Various driving simulators.
- [DutchSimulators](#) - Driving simulators for driving schools. (new link)
- [GSC](#) - Spanish simulators.

... Relevant Background - training driving simulators

- [HONDA](#) - Driving simulator with motion base.
- [Imago Systems Inc](#) - Virtual reality system.
- [Immersive Tech](#) - Mining Truck simulators.
- [Rhein-Metall](#) - Training simulators: one for Bavarian police (Germany)
- [Simulator Systems](#) - (USA) products for training
- [Simutech](#) - (Germany) low-cost simulators.
- [SoftLab simulator](#) - A training driving simulator by a company in Novosibirsk (Russia).
- [Systems Technology Inc](#) - Low cost driving simulators.
- [ThoroughTec](#) - Modelling and Simulation
- [TRUST](#) - similar driving simulator sold by Thales (Thomson Training&Simulation).

VRDS components

Simulators consist of the key components of a car such as:

- a steering wheel
- foot pedals
- signal indicators

and a screen on which a video or film presents driving scenes.

Control actuators can be either real control actuator, generic configurable control actuators with controllable characteristics or virtual control actuators

While a VRDS is not a substitute for the real world, it can be considered as a tool that helps the driver to understand the functionality of the real world's driving environment. The trainer/evaluator can use the VRDS to judge the driver's ability before he/she drives on the roadways.

Example of a VRDS



In this figure the following are part of the VRDS:

- a steering wheel
- foot pedals

and a screen on which a video or film presents driving scenes.

Summary of the main VRDS characteristics

Representation of control actuators:

- Real controls
- Generic controls
- Virtual controls (exo-skeleton)

Display devices

- HMD
- Flat projections
- Curved projections
- Combined

Stereo mode

- Active
- Passive

Tracking

- None
- Magnetic
- Optical
- Others

Advantages of VRDS

- **Interactivity:** the system has an immediate response to the driver's control.
- **Immersion:** gives the impression of driving in real conditions and roads.
- **Flexibility:** certain elements of the driving task might be changed in response to the driver's performance or in accordance to the technological advances, the changes in laws and the existing scenarios.
- **Cost effectiveness:** the recent years, VRDS based on ordinary PCs have eliminated the relevant costs.

Disadvantages of VRDS

- The use of computer-generated graphics, which in some cases appear less realistic than the videos or films, mainly when the analysis procedures are not of high quality.
- Extensive use of VR systems may cause sickness to the user, such as nausea (due to the lack of orientation).

Note: None of the aforementioned shortcomings is that serious to prevent the actual use of the VRDS.

Conclusions

- VRDS are preferable to the other types of driving simulators since they provide a more realistic view of the road conditions.
- VRDS may sometimes cause undesired effect on the user but surely it is safer than driving in real roadway.