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## **VISUALIZATION IN TRANSPORTATION – THE EFFECT OF FIELD OF VIEW ON DRIVER’S PERCEPTION OF OBJECTS IN DYNAMIC ROAD ENVIRONMENT SIMULATION**

**Keywords:** *Field of view FOV, binocular vision, stereopsis, driving simulator, virtual environment*

Visualization is becoming the most powerful tool in evaluation of designed engineering environment, especially in transportation in the current road safety problems. Driving simulators and dynamic virtual environment images are more and more widely used in driver behavior research and perception analysis. Driving simulator is a very useful tool supporting the process of transport environment designing, because it is focused on perception and the needs of user. It has a great potential in linking the engineering and human aspects in the planning and designing processes. Advanced driving simulator seems to be the most promising tool for solving problems in the process of transport and urban planning, mobility, multidisciplinary centers with high traffic volumes. Main advantages of simulation research in virtual space are unlimited reproducibility of the simulation, as well as full control of parameters and variables (geometry of roads, traffic and external factors). Integrated simulation systems are still being developed and refined. Virtual reality seems not only possible to be achieved in the near future, but also commonly used as a practical tool of transportation planner who is conscious about quality of life, safety and user’s needs.

Analysis of strengths and weaknesses, opportunities and threats (SWOT) application in integrated systems of driving simulators, carried out on the basis of existing studies indicate that advanced visualization is a promising research tool for interdisciplinary studies in transport.

Strength:

1. Repeatability of each simulation geometry,
2. Parameters of the environment, traffic and external factors under the total control of the ability to simulate every situation and road events (geometry, movement, etc.)
3. Measurability of traffic parameters with high resolution (speed, acceleration, etc.)
4. The driver is monitored and recorded in real time

Weakness:

1. Comparability of qualitative assessments and quantitative measure perception reaction,

Threats:

2. Output requiring special arrangements.

Advanced modern simulators allow you to obtain a realistic driving experience in the laboratory. The equipment usually includes high quality hydraulic devices integrated with a simulated computer-generated image, evoking the impression of a full vehicle dynamics (vibrations from the road surface, the acceleration and delays, the centrifugal force). The Visual system is usually coupled with computer graphics that allows to obtain high frequency image with minimal delays, comparing to the reality.

The current applications of driving simulators include a wide range of research and studies: research infrastructure, a system of interactions "road-car-driver", design of roads and tunnels, vehicle control, testing devices IVIS (In Vehicle Information Systems) and ergonomics, psychology, biomedical, pathological analysis, transport behavior, the effect of alcohol and drugs on the perception of the driver, the behavior and reactions of drivers in challenging road conditions (icy pavement, snow, fog, rain), the behavior of drivers with disabilities prototype testing, pavement materials and equipment, or education and training.

This paper presents a brief history of driving simulators, focusing on problems related to errors in visual fidelity of simulation. This errors are connected to miscalculating field of view displayed on simulator screens and misuse of visual hinting tied to spatial perception in virtual environment. Some guidelines are proposed to help reducing problems with simulator sickness. Some sicknesses, like dizziness, are more commonly tied to motion sickness, caused by driver brain sensing discord between eye stimulus and vestibular system. Guidelines presented in this paper aim to reduce these negative impacts, providing a description of environment and driving simulator configuration.

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