Highly Immersive Driving Simulator

Field of Study

- Driving dynamics and ride comfort simulation tests
- Analysis of the effect chain understanding of stimuli from different domains
- Human Machine Interaction (HMI) and Human Factors
- Studies on driver assistance systems (ADAS/AD)
- Traffic psychological aspects

Simulation software

- Realtime-Backbone: SIMulation Workbench
- Simulation-Framework: VI-DriveSim, Matlab Simulink
- Vehicle simulation: VI-CarRealTime
- Traffic & environment simulation: VI-WorldSim
- Visualization: VI-WorldSim
- Acoustics: Simsound

Metrics

- Driver/Mockup:
  - Gas/brake pedal actuation, steering an-gle/torque, gear, indicator, lights, hand brake
  - Touch display interaction
  - Steering wheel: Hands-On-Detection
- Traffic & Environment simulation:
  - Positions, speeds, accelerations of ego and target vehicles, suspension/powertrain/aerodynamics, sensor data etc.

Location

Driving Simulator Laboratory, 01705 Freital

Contact

Dipl.-Ing. Stefan Plaettner

stefan.plaettner@tu-dresden.de

0351-647 51948

Technical specification – Dome/Mockup

- Architecture:
  - Concurrent RealTime iHawk
    (RedHawk Linux, Xeon Gold 6234 @3.3GHz (8 CPUs), 48GB RAM, NVIDIA Quadro P400, Real-Time Clock & Interrupt Module, SIMulation Workbench)
  - Simulation Master
    (Win10, Core Ci9-10850K @3,60GHz (10 CPUs), 128GB RAM)
  - 4x Image Generator (3x Projection, 1x Mirrors)
    (Win10, Core i7-10700K @3,80GHz (8 CPUs), 32GB RAM, NVIDIA GeForce RTX 3080)

- Visualization:
  - Spherical CFRP projection screen (Dome)
    - Horizontal: 225° Field-of-View
    - Vertical: 40° Field-of-View
  - 3-channel projection system
    - NORXE P1 Projektoren with N1 lense
    - WQXGA resolution (3x 2560x1600) @120Hz
    - Projection ratio ~1:1
  - Exterior mirrors, rear view mirror, dashboard and center console designed as displays

- Acoustics:
  - 5.1 audios ystem
  - Real-time simulation of powertrain, wind, ambient traffic and tire rolling noise

- Haptics:
  - Automatic gearshift
  - D-Box Seat Shaker
  - Motorized seat belt
  - Sensodrive Force-Feedback SensoWheel
  - JoysonSafety Steering Wheel
    - 360° RGB-Lightbar
    - Hands-on-Detection
    - Individual buttons

- Misc.:
  - Individual display visualization (driver information system, HMI)
  - Contactless SmartEye head- & eyetracking

Technical specification – Motion platform

Motion platform (3 DOF*) * active	$\ddot{x}; \ddot{y}$ (m/s²) / $\ddot{\psi}$ (°/s²)	9; 9 / 206
	$\dot{x}; \dot{y}$ (m/s) / $\dot{\psi}$ (°/s)	14; 14 / 320
	$x; y$ (m) / ψ (°)	**inf; inf / inf**
Yaw bearing (1 DOF)	$\ddot{\psi}$ (°/s²)	180
	$\dot{\psi}$ (°/s)	220
	ψ (°)	**inf**
Hexapod (6 DOF)	$\ddot{x}; \ddot{y}; \ddot{z}$ (m/s²) / $\ddot{\phi}; \ddot{\theta}; \ddot{\psi}$ (°/s²)	6; 6; 9 / 300; 300; 500
	$\dot{x}; \dot{y}; \dot{z}$ (m/s) / $\dot{\phi}; \dot{\theta}; \dot{\psi}$ (°/s)	0,45; 0,45; 0,42 / 50; 50; 45
	$x; y; z$ (m) / $\phi; \theta; \psi$ (°)	0,15; 0,15; 0,13 / 17; 17; 15
Seat shaker	$\ddot{z}$ (m/s²)	10
Overall dimensions (m x m x m)	4,4 x 4,4 x 4,6	
Overall mass (kg)	~ 5000	