OPENPASS

TUAN DUONG QUANG
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Photo: Bosch
TARGET OBJECTIVES

openPASS (open Platform for Assessment of Safety Systems)

High level of transparency and acceptance through publicly available open source platform

Traffic simulation of highway, rural and urban scenarios

Stochastic variation of scenarios

Reproducibility through deterministic simulation

Standardized interfaces for model integration

Harmonized and flexible platform for effectiveness assessment of advanced driver assistance systems and automated driving
openPASS Working Group

Driver members:

**BMW GROUP**  **BOSCH**  **MERCEDES**  **TÜV SÜD**  **VOLKSWAGEN GROUP OF AMERICA**

User member:  **TOYOTA**  **ITK ENGINEERING**

Service provider:  **openPASS**  **OpenADx**  **openMobility**  **openMDM**  **OpenMCx**

Eclipse Automotive Working Groups
Scenario *

Agent Components *
- Driver
- Vehicle
- Sensor
- Function

Standardized Interfaces

SIMULATION CORE

Accident Research
Functional Development
Safety Performance Assessment
Virtual Testing / Homologation

* Simple examples are provided

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CURRENTLY AND FUTURE SUPPORTED STANDARDS

OpenSCENARIO®
bringing content to the road

OSI
Open Simulation Interface

OpenDRIVE®
managing the road ahead

fmi
FUNCTIONAL MOCK-UP INTERFACE
Platform Structure

- **User-Specific Plugins**: Implemented by the user
- **Platform Delivered Plugins**
- **Simulation Components**
- **Exemplary Agent Components**
- **User-Specific Agent Components**
- **Component Interfaces**
- **GUI (Plugin Manager)**
- **Simulation Core**

* Implemented by the user
Simulation Process

Configuration through GUI

Configuration files

Simulation execution

Output files

Evaluation in GUI

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USE CASE
TRAFFIC-SCENARIO SIMULATION

Features:
- Closed loop simulation of traffic scenarios
- Stochastic variation of the scenarios
- Intervention through detection of events and triggered actions
- Faster-than-real-time execution of the simulation

Example: AEB intervention triggered by passive cut-in manoeuvre
- Highway scenario with random surrounding traffic
- Ego vehicle with simple AEB system and abstract sensors
- Time-based event trigger
- Trajectory controlled lane change for scenario vehicle
Features:

- Create configuration files from GIDAS-PCM accident scenario database
- Stochastic variation of the scenarios (positions, velocities)
- Basis components for re-simulation: sensor, trajectory follower, two track vehicle model, impact calculation
- Store results in csv files in case folders

Example question: How many selected cases could be avoided by a AEB function?
EXEMPLARY SIMULATION RESULTS TRAFFIC-SCENARIO SIMULATION

Traffic-scenario simulation without AEB

No AEB intervention

Traffic-scenario simulation with AEB

AEB intervention triggered by passive cut-in maneuver
EXEMPLARY SIMULATION RESULTS CRASH RE-SIMULATION

Crash re-simulation from GIDAS-PCM case

Oncoming collision at intersection (LTAP – “left turn across path”) with post-crash behaviour
Eclipse Working Group **openPASS** (idea for openPASS generated within P.E.A.R.S. in 2014)

**TIMELINE**

- **08/2016** Foundation of openPASS
- **01/2018** New driver member
- **06/2018** New user member
- **11/2018** New driver member

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CONCLUSION

- openPASS is an open source platform for effectiveness assessment of advanced driver assistance systems and automated driving
- Open source platform for high level of acceptance and transparency
- Modular structure for easy platform extension and inclusion of user-specific models
- Support for standards and standardized interfaces for a flexible simulation setup
- Exemplary applications of openPASS:
  - Traffic-scenario simulation
  - Crash re-simulation