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Standardization for Vehicle Occupant Monitoring Systems (VOMS)

Overview of Current Status

Introduction

- **Project name**: ASAM Vehicle Occupant Monitoring Systems (VOMS) Concept
- **Objective**: Standardize key aspects of VOMS focusing on
  - Quality assurance, and
  - Application interface standardization
- **Initiating companies**: roboGaze, Anyverse, Luxoft
- **Target stakeholders**: Automotive OEMs, Tier1 suppliers, technology providers

The standard will not replace existing testing procedures (like Euro-NCAP's DMS testing), define hardware specifications for VOMS, or address non-VOMS vehicle systems.

Key issues adressed

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- Integration challenges
- Inconsistent performance evaluation
- Non-functional Requirements
- Interoperability Problems
- Increased Costs
- Motion Sickness

Concept project goals

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Key goals

- Identify critical elements of VOMS that need standardization
- Develop strategies for effective standardization
- Create a proof of concept for VOMS frameworks

Expected outcomes

- Enhanced safety and comfort
- Reduced development costs and integration time
- Improved interoperability and innovation
- Improved driver’s state of health

Current focus areas

- **Verification procedures**: accuracy and reliability of VOMS
- **Thresholds for warnings**: based on scientifically validated criteria
- **Reference dataset requirements**: inclusive of demographic diversity
- **Key Performance Indicators (KPI):** detection accuracy, response time, etc
- **Application interface**: focusing on logical data models and optionally communication formats, and lower OSI layers for consistent communication
- **ODD for VOMS:** Operational Design Domain specification in a standardized way
- **Simulation vs real-life data:** how to tell whether simulation data is “good enough” compared to real tests

Out of scope

- **Hardware requirements:** the standard aims to be technology agnostic; metrics and KPIs shall be independent of sensors and technologies used
- **GDPR**: sensitive data might be produced and provided but solution providers and OEMs need to ensure they comply with legal requirements

Main purposes of the standard

- Enhance **safety** by ensuring that VOMS solutions detect driver impairments effectively,
- Enhance **driver comfort**,
- Enable **driver identification**,
- Enable **reduction of motion sickness**,
- **Improve integration** by simplifying incorporation into vehicles, ensuring interoperability across platforms,
- **Reduce costs** by lowering development and integration expenses,
- Enable **easy comparison** of various VOMS products for OEMs and Tier1s,
- Be **technology-agnostic** – must be adaptable to various underlying VOMS technologies, ensuring broad adaptability.

Related standards and activities

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- ASAM OpenDRIVE, OpenSCENARIO, OpenX Ontology, SOVD, OpenMaterial
- ISO 26262, ISO 21448 (SOTIF), ISO/TS 15007, ISO 2631-1:1997, ISO 9241-307:2008
- SAE J3016, SAE J3131
- AUTOSAR Classic and Adaptive
- General Safety Regulations (EU), Euro-NCAP, GB/T 41797-2022, C-NCAP, Visual-Manual NHTSA Driver Distraction Guidelines

Related projects and organizations

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Projects and collaborations

- ADAPTIVE (EU project)
- L3Pilot (EU project)
- ASAM SOVD Project

Related organizations

- AUTOSAR
- ISO/TC 22/SC39
- SAE International
- Euro-NCAP

Verification procedures

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- Basic functionalities (detecting driver states using objective metrics)
- Advanced functionalities (e.g. driver identification or motion sickness detection)
- Scientific thresholds
- Reference dataset requirements

The standard shall also define acceptable false positive and false negative rates for both basic and advanced functionalities. It must be defined which functionalities require the evaluation of compliance with functional safety and cybersecurity conditions.

Components and features to be standardized

Application interface

- Coordinate system
- Logical data model and functions (core data entities, measurement units, and precision level)
- Required and optional features (depending on integrated sensors, supported use cases, etc.).
- Communication formats

Components and features to be standardized

Key performance indicators

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- Standardizing **essential KPIs**, such as detection accuracy, response time, memory usage, and latency, to ensure consistent evaluation across different VOMS implementations.

- Environmental adaptability: ensuring the system's performance under varying conditions, including different lighting and weather conditions, materials used in the vehicle interior, etc.

Assumptions

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- No hardware requirements
- Continued support and collaboration from key stakeholders
- Alignment with future versions of related standards and updates in global data protection regulations.

Expected deliveries of conceptualization phase

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- List of sensor types
- List of vehicle types that the standard can be applied to.
- List of features included
  - Functional safety and/or cybersecurity compliance
  - Is it mandatory or optional or to be decided in the development phase
- List of existing detection methods used
- A refined definition of distraction
- Feasibility study of simulation data evaluation

Expected deliveries of development phase

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- Quality Assurance Framework Document
- Application Interface Specification Document
- Verification Methodology Guide
- Standardized KPIs
- Implementation Support Package
- Stakeholder Feedback and Revision Log
- Proof of Concept (PoC)