eucar

EUROPEAN COUNCIL FOR AUTOMOTIVE R&D

DIGITALISATION OF ROAD TRANSPORT

EUCAR RESEARCH RECOMMENDATIONS

- In-vehicle technologies enabling automation
- Safe and robust functioning of AI-based systems
- Large scale demonstrators
- Harmonised data collection on road accidents
- Safe human-technology interaction
- Safety of Small Electric Vehicles
- Leverage increasing computing capabilities
- Digital tools for accelerated product development

In-vehicle technologies enabling automation

Efficient and robust in-vehicle systems, supporting automation, are needed for sensing, planning and acting: sensors and connectivity for acquiring environment data, computation capacity and AI for real-time decision-making. We integrate these key enablers into the vehicle and validate the overall system functioning.

⇒ **We develop in-vehicle technologies enabling automation.**

- Developing innovative hardware concepts for sensors and for computing with reduced energy consumption, vehicle technologies for cost-effective redundancies of critical components.
- Development of perception systems (incl. AI) for complex driving tasks that can provide and integrate high definition, accurate, precise input data.
- New software and methodologies development to ensure efficient use of the limited on-board power resources. This also include computation in the cloud to allow more intensive methods to be used (larger networks, bayesian neural networks, large ensembles, etc.).

Safe and robust functioning of AI-based systems

Artificial Intelligence (AI) is a major enabler for the automotive industry. However, its safe, inclusive, and secure implementation pose a variety of challenges, e.g. industrialisation, continuous improvement, verification and validation.

⇒ **We ensure the safe and robust functioning of AI-based systems.**

- Developing/promoting new functional safety methods and measures to validate AI-based systems and algorithms used.
- Define boundary conditions for self-learning systems assessing the need for continuous safety validation.
- Developing accepted metrics for the evaluation of AI algorithm. This requires gathering relevant sets of real and synthetic scenarios to serve the metrics for safety proof.

Large scale demonstrators

Genuine user adoption will be the key enabler for large-scale deployment of automated vehicles. A key objective is building trust in the technology, while demonstrating in full transparency the safety of the functioning of the system.

⇒ **We validate and verify the overall system functionality in Large scale demonstrators.**

- Plan and perform Field Operational Tests for SAE level 3 vehicles (large-scale) and Pilot tests for SAE level 4 vehicles (prototype).
- Develop simulation and virtual testing of the automated vehicle functions (methodologies and models; frameworks; tools) to validate and verify system functionality.
- Integrate automated vehicles into transport system: interaction with road, communication and cloud infrastructure.
- Conduct extensive public awareness campaigns and education.

⇒ Harmonised data collection on road accidents

The accident statistics over the past 10 years show that further reducing accidents is becoming more challenging. A more systemic approach covering vehicles and road users is needed to achieve Vision Zero. Consistent methods and assessment tools are required to fully understand the safety impact of further digitalisation of road transport and derive safety requirements. We increase knowledge and data collection on accident causation and improve risk mitigation.

⇒ **We set up harmonised data collection to further increase knowledge on accident causation and improved risk mitigation for achieving Vision Zero.**

- Preparing harmonised data gathering to further extract knowledge on accidents and their causes, and to develop mechanisms and measures for reducing them even further.
- Developing new methods to predict the effects of new technologies, infrastructure or behavioural change.
- Ensuring validation against retrospective studies after sufficient fleet penetration.

Safe human-technology interaction

The driver and the driving task remain relevant, even for vehicles at all levels of automation human technology interaction is important for road safety. This includes the interaction with other road users. This human-technology interaction has to be self-explanatory, intuitive and inclusive for all road actors (e.g. vulnerable road users).

⇒ **We develop safe human-technology interaction.**

- Improving fundamental understanding of safety-critical contributors to distraction, misinterpretation, bias of contunity.
- Developing acceptable/suitable countermeasure strategies and improve human-technology interaction for addressing these critical contributors.
- Developing strategies to avoid driver disengagement and reduce cognitive load in critical situations, as well as behavioural models and methodologies to identify activities/behaviours that should be avoided.
- Innovating in cabin monitoring and multi-modal sensing technologies as well as robust detection/prediction of driver cognitive status adapted to the situation awareness.

Safety of Small Electric Vehicles

Small and lightweight electric vehicles (SEVs, L6E, L7e and everything under M1) have an environmental benefit, lower costs, as well as needing less parking space. Safety for these vehicle categories is not addressed in regulation. Harmonised requirements can help improving safety. We improve road safety for Small Electric Vehicles with validation methodologies and tools for safety assessment and analysing SEV in mixed traffic.

⇒ **We address safety of Small Electric Vehicles.**

- Enhancing safety of SEVs, considering not only in-vehicle solutions but also infrastructure measures that could allow to better integrate these vehicles within the mixed traffic.
- Defining the minimum level of safety requirements for such vehicles, which can be applied in a harmonised approach.
- The occupant safety of such vehicles needs to be continuously and properly addressed. Protective systems and safety solutions should be based on a sound understanding of injury mechanisms and the potential for mitigating injury consequences.

⇒ Leverage increasing computing capabilities

Highly efficient software tools used by the automotive industry play a key role in accelerating vehicle development, testing and validation while also being used to identify suitable replacements of critical materials.

⇒ **We leverage increasing computing capabilities to improve computer-aided material design.**

- Integrating of AI Methods into CAE simulations.
- Implementing self-learning/generative models to reduce development time and the number of computationally extensive simulations for virtual validation.
- Integration of AI, machine learning and big data methodologies for material design which will allow to find suitable replacements for critical and hazardous materials.
- Development of functional smart materials to reduce weight and decrease the volume of vehicle components and systems.

Digital tools for accelerated product development

To leverage the increased computing capabilities of innovative software and hardware, increasing the sustainability and competitiveness of the automotive industry.

⇒ **We develop and validate digital tools for accelerated product development.**

- Digitalisation of design and production processes, which accelerates the uptake of advanced technologies for zero tailpipe emission vehicles.
- Enabling the design of new modular, flexible and individualised optimal concepts.
- Improving solvers' accuracy to simulate real-world conditions and correlations between open road, testing facilities and virtual models/ digital twins.
- Virtual verification, validation (testing), comparison and scaling-up of zero tailpipe emission vehicles themselves and in the system, linked to the LCA approach and circular economy aspects for sustainable and innovative road mobility solutions.