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Fraunhofer at IAA MOBILITY 2025

AktiMeter — Intelligent Behavioral Analysis in Real Time

Researchers at the Fraunhofer Institute of Optronics, System Technologies and Image Exploitation IOSB have developed a technology that uses AI to automatically log and analyze human movements inside vehicles. Their innovation, called the AktiMeter, is ideal for market research, user-centered product development and ergonomic studies.

Eye tracking systems are already in use in many industries, such as market research and development of distraction-free vehicle features. Researchers at Fraunhofer IOSB have now developed an innovative measuring system that goes one step beyond this. Called the AktiMeter, it captures information on vehicle occupants' entire bodies. This provides insight into people's sitting positions, movements and gestures, activities and intentions.

The technology can determine where a person's arms and hands are located, in which direction the driver's head turns and what objects are used in the vehicle's interior. This opens up new prospects for research, as long car trips can be analyzed automatically.

Deeper understanding of behavior inside the vehicle

Fraunhofer IOSB specializes in computer vision, which means the researchers there interpret anything and everything that can be captured by optical sensors, such as cameras. Frederik Diederichs and his team use this information to improve human-AI interactions inside the vehicle. Future self-driving applications could benefit from the data collected, as it serves as a basis for developing smart driver assistance systems that respond to the behavior and needs of vehicle occupants.

Advanced AI technology as a basis

The AktiMeter combines computer vision techniques based on artificial intelligence, which can recognize body poses and objects, with a 3D model of the vehicle. Machine learning processes can then draw further conclusions from this, for example about the activity. This approach is especially suitable for fast, energy-conserving analyses without a cloud connection or powerful hardware in the car itself. Advanced vision language models have also been incorporated to make it possible to capture information on even complex interior situations that have not been foreseen by developers. This allows AktiMeter users to define their own specific scenarios for the system to record.

Automatic data interpretation is used to create a 3D digital twin of the vehicle's interior. This data source is used to draw conclusions directly in the vehicle. This minimizes

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the amount of storage required while eliminating the need to store image data that could pose issues under the EU General Data Protection Regulation (GDPR). The AktiMeter allows customers to generate detailed statistics relating to actual usage behavior inside cars and trucks.

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Versatile applications to optimize safety and driving experience

The AktiMeter is a valuable tool for prototype development for automotive manufacturers and their research departments. Anonymized long-distance data on usage behavior can help to train new AI functions — without expensive manual analyses.

Market research institutes can also use the AktiMeter to collect and automatically analyze empirical data about the use of new vehicle functions: How often is the beverage holder used, how does the interior support users while eating, how often do people actually pick up their cell phones and how often is the seat adjusted incorrectly? Especially in the case of automated driving, some of these questions can be very important. What do occupants prefer to do when the vehicle is in self-driving mode, and how can the interior be optimally tailored to reflect those preferences? The findings gleaned support the development of market-driven solutions and promote the industry's innovative strength. On the whole, all of these potential applications are aimed at enhancing user friendliness inside the vehicle and achieving lasting improvements in driver experience.

One challenge in terms of both research and application lies in the methods that have been used to date: "Previous methods are trained on predefined situations from which training data was collected in a laborious and time-consuming process. Thanks to the use of generative AI, it is now possible to use the AktiMeter to define situations flexibly without having to collect training data," explains Manuel Martin, a senior scientist in the Perceptual User Interfaces working group at Fraunhofer IOSB.

Prototype development and market launch

Right now, the AktiMeter is already being tested in prototype development. Plans call for the market launch to take place in mid-2026. Until then, the researchers will be working to validate the measuring systems and determine how reliable the systems are in which situations. Work is under way on the conceptual design of an overall system encompassing cameras, a computer and a user guide so customers can calibrate the system themselves and perform the desired analyses via a user-friendly interface. "We firmly believe the AktiMeter will play an important role in future vehicle interior research. It is a flexible, modular solution that can adapt to the needs of the automotive industry," Diederichs notes.

The researchers will be presenting their technology in a level 3 automated vehicle at the joint Fraunhofer booth (Hall A2, Booth C10) at IAA MOBILITY (September 9–12, 2025).

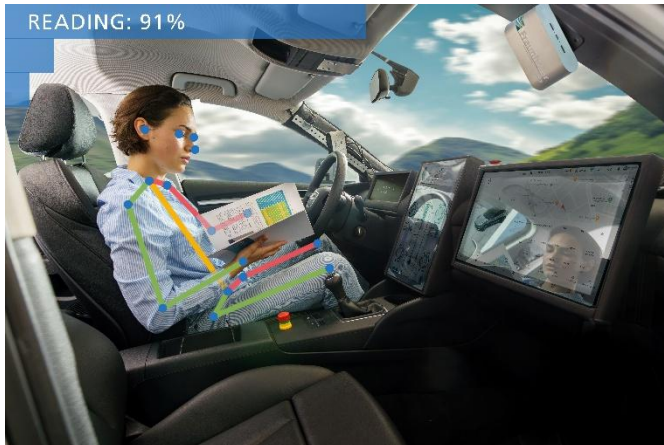


Fig. 1 The AktiMeter's algorithms recognize activities such as "reading" with high accuracy in real time, allowing for local analysis of the data that has been collected. This makes it not only efficient but also compliant with the EU General Data Protection Regulation (GDPR).

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