

Road Traffic of the Future: Will Humanoid Robots Take Over Driving?

The Institute for Automotive Engineering presents its “Humanoid Chauffeur” project at the Aachen Automotive Colloquium.

Aachen, October 5, 2026 – “Physical AI” and “Embodied AI” are currently dominating the news, with humanoid robots—at the forefront of this development—being one of the main topics. Thanks to the rapid advancement of artificial intelligence, applications that seemed futuristic just a few years ago are becoming a reality. This inevitably raises the question of which specific tasks human-like machines might take over in the future.

At the Aachen Automotive Colloquium, ika will present the “Humanoid Chauffeur” project. As part of the project, a humanoid robot was trained to autonomously operate conventional commercial vehicles not originally designed for autonomous driving. This approach thus opens up the possibility of retrofitting existing vehicles with automation capabilities, thereby avoiding the need to invest in a new automated vehicle.

The project aims to use humanoid robots as a key component in the automation of a wide variety of special-purpose vehicles, such as those used for street cleaning. This allows current vehicles to be retrofitted with automation without requiring major technical modifications. Due to their resemblance to humans, these robots can also communicate with other road users, for example, through hand gestures and head movements.

Humanoid robots are already being used at some production sites to assist people with a variety of tasks. However, their potential extends far beyond industrial production. This is because their human-like form is not merely a matter of appearance but is based on a functional technical concept: Equipped with legs, arms, hands, and the appropriate sensors, humanoid robots are designed to move through environments and interact with tools and systems originally developed for humans. This allows them to use doors and stairs, tools and machines, as well as vehicles and their controls, without having to completely adapt the existing infrastructure.

To do this, they must.

- perceive and interpret their environment,
- understand situations and tasks in context,
- coordinate the movements of their legs, arms, and hands,
- control their balance and whole-body movement,
- handle uncertainties in dynamic environments, and
- interact safely with humans.

Prof. Dr.-Ing. Lutz Eckstein, Director of the Institute for Automotive Engineering (ika), RWTH Aachen University: “We at ika have been aware of and addressing these challenges for many years through the development of automated vehicles—for example, in sensor interpretation, real-time decision-making, and safe motion planning. Our humanoid driver HAINZ therefore uses the recently released

software framework ‘openADS’ as the core of its intelligence. Humanoid robots offer excellent capabilities when it comes to interacting with other road users. Conversely, however, their use as robotic drivers places high demands on their design—demands that commercially available devices currently do not meet.”

Thomas Lennartz, Head of Vehicle Concepts, ika, RWTH Aachen University: “Humanoid robotics allows us to think beyond the boundaries of individual systems when it comes to automation. Instead of developing a separate technical solution for each task, we are investigating how a humanoid robot can take on various activities designed for humans—from driving to loading and unloading to working on the vehicle. This opens up entirely new perspectives for end-to-end automation concepts.”

The demonstrator presented at the conference marks a first step in this direction:

In the presented set-up, the humanoid robot “HAINZ” is seated in a truck driving simulator and takes full control of the driving task. Subsequent projects will involve the transition from the virtual to the real world: HAINZ will then drive a real commercial vehicle and perform initial driving maneuvers with it on a test track.

About the Institute for Automotive Engineering (ika) at RWTH Aachen University

As part of RWTH Aachen University, the Institute for Automotive Engineering (ika) conducts research on the complete vehicle, including its systems and their interactions. From the initial idea through innovative component and system concepts to vehicle prototypes, the institute’s staff are shaping the vehicle of the future. The ika makes a recognized contribution to solving current and future challenges, both in public projects and in cooperation with automakers and suppliers.

The foundation for the intensive research conducted for large segments of the automotive industry as well as for public funding agencies at the EU, federal, and state levels is ika’s extensive infrastructure, which ranges from powertrain, battery, chassis, and tire test benches to acoustic, thermodynamic, and servo-hydraulic test facilities, as well as a full-vehicle crash test facility and test tracks equipped with state-of-the-art measurement technology. In addition, the institute is equipped with state-of-the-art software and hardware for all necessary simulation disciplines. ika employs approximately 120 permanent staff members and more than 80 student assistants. Furthermore, approximately 100 student theses are produced annually as part of the research and development activities.

www.ika.rwth-aachen.de

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If you have any questions or would like additional material, please contact:

Nikola Druce, M.A.

Phone: +49 241 80 25668

Email: nikola.druce@ika.rwth-aachen.de