

Press release

September 26, 2023

PI 11720 jck/af

How connectivity can make city traffic safer and more efficient

LUKAS research project presents its results

- ▶ Bosch presents results of the LUKAS project together with Mercedes-Benz, Nokia, IT-Designers, InMach, Ulm University, and the University of Duisburg-Essen.
- ▶ Cooperative behavior planning makes automated driving in mixed traffic safer and more efficient.
- ▶ Edge servers and sensors on streetlights assist cooperative behavior in city traffic.

Stuttgart, Germany – The digital transformation, increasing urbanization and automation, as well as the need for greater energy efficiency and climate action are tough challenges currently facing the mobility sector. In the three-year LUKAS research project, Bosch, InMach, IT-Designers, Mercedes-Benz, Nokia, Ulm University, and the University of Duisburg-Essen are researching how to improve traffic efficiency and safety in future mixed traffic scenarios of urban traffic environments. LUKAS is the abbreviation of the German name "Lokales Umfeldmodell für das kooperative, automatisierte Fahren in komplexen Verkehrsssituationen" (local environment model for cooperative automated driving in complex traffic situations). Reliable communication between automated and non-automated traffic participants as well as within the infrastructure plays a key role here. The project was funded by the German Federal Ministry for Economic Affairs and Climate Action (BMWK) with 5.2 million euros as part of its program for new vehicle and systems technology.

Using data from the local environment for more safety and efficiency

To increase traffic efficiency and safety in future mixed traffic scenarios of urban traffic environments, the LUKAS research project uses all the information available within the local environment. This includes, for example, information from infrastructure sensors, connected cars and commercial vehicles, and mobile devices such as smartphones used by pedestrians or cyclists. This concept provides anonymized data from traffic participants and stationary objects, including values such as position, extent, and possibly the travel speed and direction of movement. The preprocessed sensor information is relayed to an edge server, which is directly connected to the 5G network near the junction and provides data transmission with minimal delay times.

A fusion algorithm on the edge server is able to create a comprehensive model of the local surroundings and use this as the basis to plan maneuvers for connected traffic participants. Object information from the server's environment model is fed back to the road users. This expands their overview to include areas that they cannot detect themselves. "The edge server uses methods of artificial intelligence (AI), among others, to calculate an optimized, cooperative maneuver and then sends instructions to the connected participants. This approach makes it possible to increase the overall energy efficiency of a traffic scenario and the safety of traffic participants, especially those who are vulnerable," explains Dr. Rüdiger Walter Henn, head of the LUKAS project at Bosch, the consortium leader.

LUKAS pilot installation in Ulm-Lehr

To run the tests, which took place in a public area in the suburb of Ulm-Lehr, the consortium used a pilot installation supported by the city of Ulm and operated by Ulm University. The selected area contains a junction with a right-of-way street turning off and a side street entering. The buildings there obscure the right-of-way, which makes this street situation particularly interesting for real traffic scenarios. "This installation gives us excellent opportunities to use real traffic situations to test the approaches we have researched and developed, so we can very quickly draw conclusions about their suitability for practical use," explains Dr. Michael Buchholz, who heads the Electric Mobility and Connected Driving/Connected Infrastructure research groups at the Institute of Measurement, Control and Microtechnology at Ulm University and is responsible for the pilot installation.

The lampposts in the vicinity of the junction are equipped with video, lidar, and radar sensors to detect and classify the flowing traffic. The object information is sent to the edge server via a 5G network from the partner Nokia. Due to data protection reasons, persons and vehicles are not able to be identified. The edge server hosts the global environment model, several evaluated variations of cooperative maneuver planning, and a warning module for pedestrians and cyclists.

Connectivity makes travel safer and more efficient

To depict cooperative use cases in mixed traffic, Bosch, Mercedes-Benz, and Ulm University bring in connected, partially automated passenger cars. InMach provides a connected prototype of a street sweeper. Special smartphone apps from IT-Designers GmbH and Nokia make it possible to connect pedestrians and cyclists with the edge server. IT-Designers collects data using a video drone to assist in the simulation of the traffic scenarios, while the University of Duisburg-Essen supports the project with traffic flow simulations.

All tested use cases verified the benefits of the LUKAS approach in terms of increasing traffic efficiency and safety. Simulation results from AI-based planning algorithms lead researchers to expect a significant increase in the traffic flow. Studies by the partner Mercedes-Benz show a significant reduction in fuel consumption and a decrease in the time required to pass through the junction in comparison to conventional driving. By delaying oncoming traffic to allow for cooperative behavior, participants passing stationary vehicles and vulnerable traffic participants crossing the road are protected in obscured areas. Thanks to the new technology and cooperative scenario planning, traffic participants recognize early on which driving strategy will enable them to behave safely and efficiently.

The results of the LUKAS project have allowed the partners of the consortium to gain informative experience about connected, cooperative driving and incorporate this into the development of new products. The approach developed by LUKAS can help make automated driving in urban mixed traffic safer and more efficient for all traffic participants.

Press photos: #a31ea175, #79db5e98, #1eb584e9

Contact person for press inquiries:

Jennifer Kallweit,

Phone: +49 711 811-42239

E-mail: jennifer.kallweit@de.bosch.com

The Bosch Group is a leading global supplier of technology and services. It employs roughly 421,000 associates worldwide (as of December 31, 2022). The company generated sales of 88.2 billion euros in 2022. Its operations are divided into four business sectors: Mobility, Industrial Technology, Consumer Goods, and Energy and Building Technology. As a leading IoT provider, Bosch offers innovative solutions for smart homes, Industry 4.0, and connected mobility. Bosch is pursuing a vision of mobility that is sustainable, safe, and exciting. It uses its expertise in sensor technology, software, and services, as well as its own IoT cloud, to offer its customers connected, cross-domain solutions from a single source. The Bosch Group's strategic objective is to facilitate connected living with products and solutions that either contain artificial intelligence (AI) or have been developed or manufactured with its help. Bosch improves quality of life worldwide with products and services that are innovative and spark enthusiasm. In short, Bosch creates technology that is "Invented for life." The Bosch Group comprises Robert Bosch GmbH and its roughly 470 subsidiary and regional companies in over 60 countries. Including sales and service partners, Bosch's global manufacturing, engineering, and sales network covers nearly every country in the world. With its more than 400 locations worldwide, the Bosch Group has been carbon neutral since the first quarter of 2020. The basis for the company's future growth is its innovative strength. At 136 locations across the globe, Bosch employs some 85,500 associates in research and development, of which nearly 44,000 are software engineers.

The company was set up in Stuttgart in 1886 by Robert Bosch (1861–1942) as "Workshop for Precision Mechanics and Electrical Engineering." The special ownership structure of Robert Bosch GmbH guarantees the entrepreneurial freedom of the Bosch Group, making it possible for the company to plan over the long term and to undertake significant upfront investments in the safeguarding of its future. Ninety-four percent of the share capital of Robert Bosch GmbH is held by Robert Bosch Stiftung GmbH, a charitable foundation. The remaining shares are held by Robert Bosch GmbH and by a corporation owned by the Bosch family. The majority of voting rights are held by Robert Bosch Industrietreuhand KG, an industrial trust. The entrepreneurial ownership functions are carried out by the trust.

Additional information is available online at www.bosch.com, www.iot.bosch.com, www.bosch-press.com, [www.twitter.com/BoschPress](https://twitter.com/BoschPress)