PRESS RELEASE

Research project "KI-FLEX": how new AI-based electronic solutions can make autonomous driving safer

Erlangen: Fully automated and autonomous vehicles should be able to respond appropriately in every situation. Together with partners in the "KI-FLEX" project, the Fraunhofer Institute for Integrated Circuits IIS is developing a platform that uses artificial intelligence methods to help measure vehicle position and determine vehicle environment in the future.

As part of the "KI-FLEX" project, sponsored by the German Federal Ministry of Education and Research (BMBF), Fraunhofer IIS is leading the development of a software programmable and reconfigurable hardware platform that processes sensor data with AI-based methods for autonomous driving. The project is a key step in the development of technology components that are urgently required to make autonomous driving safe and reliable.

Autonomous driving is dependent on the fast and reliable processing and merging of data from laser, camera and radar sensors in cars. As a result, the vehicle always has an accurate picture of the actual traffic conditions, can locate its own position in this environment, and, on the basis of this information, make the right decision in every driving situation. The data that the vehicle must process to determine its environment is so complex that artificial intelligence methods are required to ensure a high level of safety on the roads.

To this end, Fraunhofer IIS and partners are working on the "KI-FLEX" project to develop a powerful hardware platform and the associated software framework. The algorithms used for sensor signal processing and sensor data fusion are largely based on neural networks and enable the vehicle's exact position and environment to be determined.

Reconfigurable, secure and efficient

The relevance and usability of individual sensors varies depending on the traffic situation and on the weather and light conditions. To account for this, the platform is being designed as software programmable and reconfigurable hardware, which means that the algorithms used for sensor evaluation can be switched in line with changing driving conditions. This enables the vehicle to respond flexibly if individual sensors are

compromised or if they fail. In addition, the project team will develop suitable methods and tools for ensuring the functional safety of the AI algorithms used and their interactions, even if the algorithms are reconfigured while the vehicle is on the road. To enable all algorithms and reconfigurations to be executed efficiently, the hardware platform's computing resources are allocated dynamically according to load.

Future-proof, neuromorphic technology component

The planned platform is a new development in the field of neuromorphic hardware, the functionality of which is inspired by the human brain and specially designed and optimized for the efficient use of neural networks. A key consideration in the project is that while product cycles in the automotive sector are very long, AI algorithms are advancing very rapidly. The project partners are therefore working towards a hardware platform that can be quickly and easily adapted to new software and hardware requirements in the field of machine learning. To achieve this, they are focusing on using a flexibly programmable multi-core deep learning accelerator in the form of a specially developed chip (ASIC). Such ASICs help reduce costs and power consumption compared to conventional multi-purpose processors (CPUs) or graphics processing units (GPUs). On that basis, the project is playing an important role in driving forward both science and the automotive industry in the field of autonomous driving.

Project consortium comprising research and industry partners

The joint "KI-FLEX" project, which runs through August 2022, is sponsored by the German Federal Ministry of Education and Research (BMBF) within the framework of the guidelines on promoting research initiatives in the field of "AI-based electronic solutions for safe autonomous driving (AI element: autonomous driving)."

Fraunhofer IIS is leading the project consortium, which comprises the following research and industry partners: Ibeo Automotive Systems GmbH, Infineon Technologies AG, videantis GmbH, Technical University of Munich (Chair of Robotics, Artificial Intelligence and Real-time Systems), Fraunhofer Institute for Open Communication Systems FOKUS, Daimler Center for Automotive IT Innovations (DCAITI, Technical University of Berlin) and FAU Erlangen-Nürnberg (Chair of Computer Science 3: Computer Architecture).