

## Digital Assistant Makes Assembly More Efficient

From Development to the Finished Product - Artificial Intelligence and CAD Data Facilitate Part Recognition

Artificial intelligence (AI) enables machines to see and recognize objects. Training AI requires large amounts of high-quality image data which needs to be prepared manually. The startup Kimoknow, which emerged from Karlsruhe Institute of Technology (KIT), has developed a trendsetting technology to automate this training. This technology is the basis for a digital assembly assistant for efficient cooperation between human and machine.

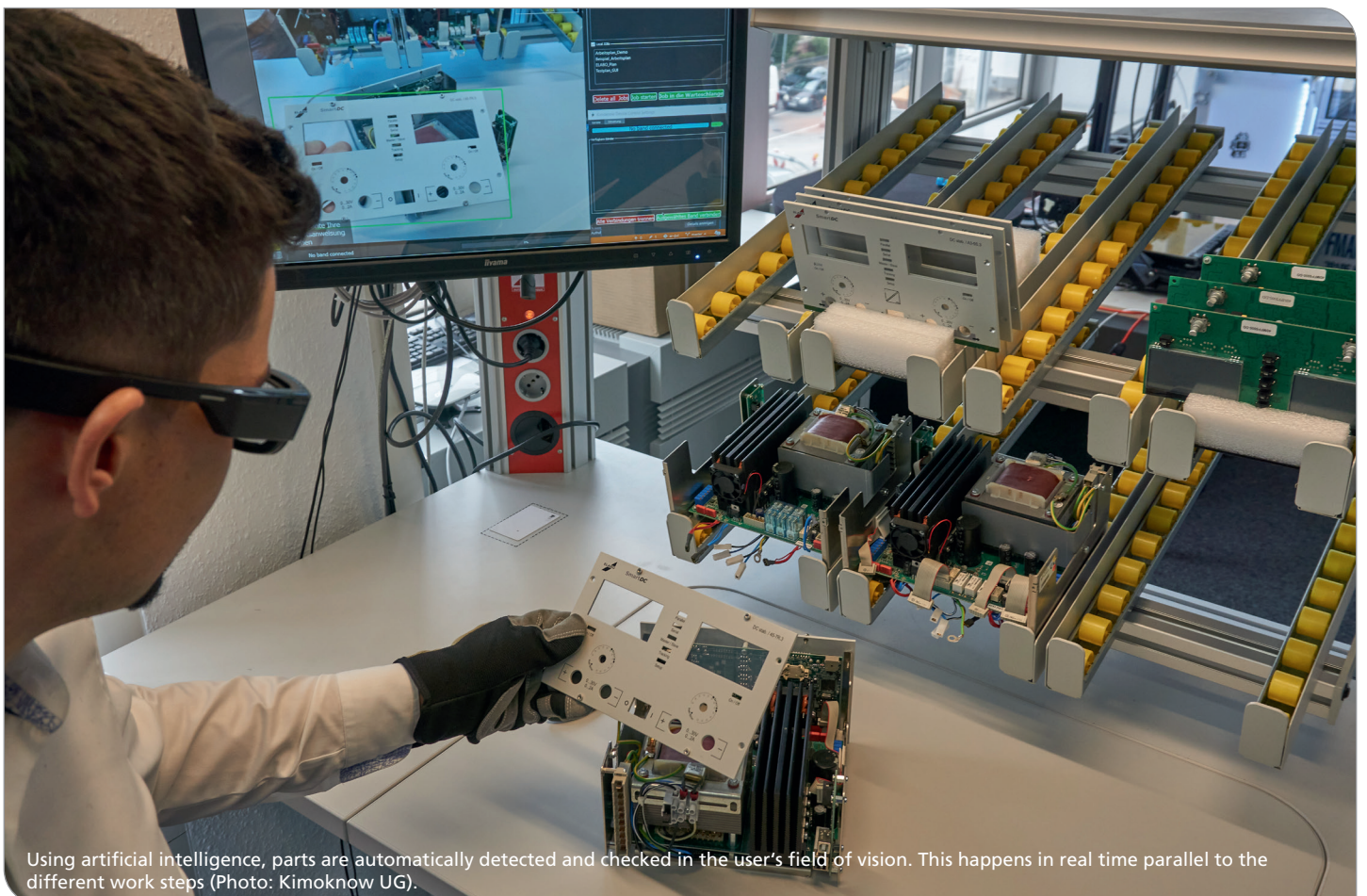
*„AI solutions must be quick,  
pragmatic, and action-oriented.*

*The focus here must be on supporting people.“*

Quote from Prof. Jivka Ovtcharova, Head of IMI

### Zero-defect Assembly with Object Recognition and Augmented Reality

The Kimoknow digital assistance system supports skilled workers in the assembly of complex devices: It guides users through the entire assembly process, recognizes work steps and components, and visualizes instructions step by step without an additional display. In this way, it shows which parts are to be processed in which order with which tools and assembly materials. If errors occur, the digital assistant repeats the corresponding steps. It documents the entire process. The assembly operator works hands-free and communicates with the system via eye contact, hand signals, or voice commands. The digital assistant thus makes the assembly process as a whole more efficient, more productive, faster, and more cost-effective. In addition, it increases the quality of the products.



Using artificial intelligence, parts are automatically detected and checked in the user's field of vision. This happens in real time parallel to the different work steps (Photo: Kimoknow UG).

## CAD Data Simplify Part Recognition

Automatic part recognition with artificial intelligence supports the assistant in a context-dependent, targeted, and thus maximally efficient manner. However, developing and setting up part recognition bring further challenges due to requiring large amounts of high-quality image data with which the algorithms need to be trained manually. Training AI systems to recognize objects in this way requires a high computational effort, is inflexible, highly environment-dependent, time-consuming, and expensive.

The greatest effort in part recognition is in the creation of the database, the so-called labeling. For this reason, Kimoknow uses image data that accumulate anyway for all objects in computer-aided design (CAD) and production data management (PDM) processes and provide information about e.g. the material, geometry, and position of the respective object. The CAD and PDM data are extracted and used for the automated training of the AI. This saves thousands of hours of manual work in developing part recognition.



Augmented-reality glasses allow the digital assistant to understand what the user sees. This allows humans and machines to communicate in real time (Photo: Tanja Meißner/KIT).



Automatic testing and documentation enable more efficient processes at a higher level of quality (Photo: Tanja Meißner/KIT).

Karlsruhe Institute of Technology (KIT)  
Kriegsstraße 77  
76131 Karlsruhe, Germany

Michael W. Grethler  
Head of Unit Digital Twin  
Institute for Information Management in Engineering (IMI)  
Phone: +49 721 608-46628  
Mobile: +49 172 6385401  
Email: michael.grethler@kit.edu  
www.imi.kit.edu



Kimoknow UG (limited liability)  
Moningerstraße 30  
76135 Karlsruhe  
Email: info@kimoknow.de

Karlsruhe Institute of Technology (KIT) · President Professor Dr.-Ing. Holger Hanselka · Kaiserstraße 12 · 76131 Karlsruhe, Germany