

Press release

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Contact:
Ruth Wallner
BAUER Aktiengesellschaft
BAUER-Strasse 1
86529 Schrobenhausen, Germany
Phone: +49 8252 97-1844
public.relations@bauer.de
www.bauer.de/en

AI assistance for specialist foundation engineering equipment: Research project successfully concluded

- Three-year research project on operator-centered assistance for mobile construction equipment in specialist foundation engineering
- Project partners: Bauer Maschinen, Hawe Hydraulik, STW, and two chairs from the Technical University of Munich
- BAUER GB 50 grab used as demonstrator
- Shared control platform as central one result of the project

Schrobenhausen, Germany – Operating large, mobile hydraulic construction equipment is a demanding task. Safe and efficient operation depends primarily on the operator's experience – expertise that can take years to acquire. Less experienced operators often reach their limits quickly. This is precisely where the recently concluded OPAI4DNCS research project, funded by the Bavarian Research Foundation (BFS), stepped in.

Industry and science joining forces

For this project, BAUER Maschinen GmbH, HAWE Hydraulik SE and STW (Sensor-Technik Wiedemann GmbH) collaborated closely with the Chair of Automation and Information Systems as well as the Chair of Ergonomics at Munich Technical University. Over the course of three years, the project partners explored operator-centered assistance for mobile construction equipment used in specialist foundation engineering.

Needs-based assistance from AI

The aim of this project was to develop adaptive, intelligent, and self-learning control systems based on multi-agent systems (MAS). The focus was on needs-based assistance of machine operators to enable safe operation even in borderline situations.

Bauer grab used as test vehicle

The technology was demonstrated using a hydraulic grab, typically used in the construction of diaphragm walls. The crucial factors were dampening vibrations and stabilizing the grab. Operating the grab is particularly challenging due to its swinging bucket. Using a soft sensor to measure the pendulum movements caused by pressure fluctuations on the hydraulic actuators, a real assistance system was developed and successfully implemented in test campaigns.

Human-AI collaboration

One central result of the project was the development of a shared-control platform that enables intuitive collaboration between human operators and artificial intelligence. A retrofitting solution was established that can extend existing control systems with intelligent functions, without requiring major changes to the machine's architecture. The assistance

system offers three different control modes tailored to the operator's experience level. Combined with a multi-agent architecture, the system delivers flexible, context-sensitive assistance for complex control tasks – improving efficiency, safety and resource conservation on construction sites.

Image: pressebild-press-image-forschungsprojekt-research-project-opai4dnsc-bauer-maschinen



BAUER GB 50 hydraulic grab – the same grab type was used as a demonstrator in the research project. © BAUER Group

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