CLEVR CASE STUDY “CLEVRASSIST” WITH FESTO AND DFKI

CLEVR

Low-code software in synergistic combination with automation technology and AI:

CLEVRASSIST AS THE CORE OF INDUSTRIAL DIGITAL ASSISTANCE SYSTEMS OF THE FUTURE

Manufacturing sophisticated industrial products, maintaining or installing modern machines or systems, providing technical support - all production operations need qualified employees so that value-added processes and work processes can run smoothly. Digital assistance systems open up opportunities for guiding and training people in a specific situation, individually and intelligently, for precisely this purpose - especially at a time when skilled workers are in short supply. CLEVR, the fast-growing technology solutions company, has leveraged its software and industry expertise to develop “CLEVRAssist”, an application capable of operating as the central core of a new generation of digital assistance systems for Industry 4.0. The CLEVR app, developed on the Mendix low-code platform, precisely maps the processes for digital assistance and controls the communication between the human in training and the assistance workstation. During this process, it also collects real-time data from peripheral devices, integrates AI-based analysis of movement data, and issues recommendations for action that are tailored to the user.

CLEVRAssist is the result of a joint research project resulting from the collaboration with the Festo Learning Center - the education and training institute of Germany's leading international automation technology company - and the German Research Centre for Artificial Intelligence (DFKI). Together, the three partners have developed a prototype industrial assistance workstation that enables true interactive and situational learning: Festo designed the semi-automated assembly workstation with all the necessary automation components, while DFKI developed the sensor technology as well as the AI-based analysis of human movement data. As a specialist in industrial solutions and a leading partner of Mendix and Siemens, CLEVR developed the low-code CLEVRAssist application, which acts as the linchpin to bring together all the workplace data and control real-time communication with the human operative who is learning the job.

Intelligent and adaptive qualification concepts from Festo

Klaus Herrmann, Head of Research at the Festo Learning Center, summarises the issues addressed in this joint project as follows: “A key question today, particularly at a time when skilled workers are in short supply, is how digital assistance systems can help workers gain the more advanced qualifications they need. Furthermore, this new generation of assistance and learning systems needs to be context-sensitive, intelligent and adaptive. The current challenge, and innovative focus, is to capture people's actions and movements in the workplace in real time, assess them and, on this basis, generate individualised recommendations and information that result in both error-free operations and a situational knowledge transfer to the employee, which is fully individualised according to his or her personal learning level.”

The Festo Learning Center is an important qualification partner for industry. It establishes initial operational baselines and develops holistic solutions for supported work and situational learning in companies - in a way that precisely interlinks assistance and learning. In this joint project, Festo designed a prototype industrial assistance workstation, which provides instruction and guides users through each step of the partially automated process. Components such as pick by light, beamer or laser projection, camera inspection and identification by RFID, barcode or QR code not only support the various work steps, they also send feedback relating to some activities back to the assistance system. In this prototype industrial workstation that brings together assistance and learning, data generated in the work situation is

collected by the automation components and the system recognises, for example, whether a certain part of the appropriate length has been installed, or whether a torque wrench has been used correctly.

Real-time activity tracking and process mining with AI from DFKI

But not all human activities can be captured by technical peripherals. So DFKI addressed the challenge of deploying artificial intelligence (AI) to identify and analyse movement patterns based on the sensor-based human movements captured at the assistance workstation, and then use the results to report back to the user in the form of context-sensitive and personalised recommendations for the next work step. DFKI developed an AI component that collects position data from sensor points on the wrists, elbows, and/or torso in a real-time activity tracking mode and performs process mining based on neural networks. It feeds this movement data into its Process Engine to identify significant movement patterns and generate personalised recommendations for action that are tailored to the human user. “Once the movement patterns have been identified, the activities at the assistance workstation can be reliably recognised and the people in training can be given precise action recommendations”, says Sarah Rübel. “AI in this application facilitates situational learning that takes into account the human operators’ practical experience and the real-world conditions in real time.”

Software in control: CLEVR's low-code application

The CLEVRAssist app brings together all the data flows and manages communication with the user. The software application operates at three main levels to achieve this:

- The cloud-based Mendix platform is the central component that regulates application access and ensures security.
- It uses an IoT interface to collect all the data from the workstation’s peripheral devices; i.e. the data that is reported back in each specific case via interactive components such as pick by light, sensors in the robot arm or a calliper gauge.
- The CLEVRAssist app digitally maps this data in its processes, integrates the AI-based recommendations and can also be connected quickly and easily to existing cloud environments, ERP systems or CRM systems via standardised API interfaces.

The CLEVR application handles communication and interaction with the learning human at the assistance workstation in accordance with didactic best practices, and dynamically adapts the assistance to the personal needs of the trainee or worker.

Contribution to industrial value creation

“With the development of the CLEVRAssist application and our joint industrial assistance workstation, we and our partners have demonstrated what state-of-the-art digital assistance systems are all about," says Sven Jerusalem, Head of Business Development at CLEVR, summarising the project. “Digital assistance systems of this new generation create high added value in many scenarios. Industrial companies not only benefit from them as a technical training aid, they are

also a useful tool in production - especially in demanding workplaces or in a variant production situation where the processes only differ slightly but quality and zero errors are paramount.”

In the future, the CLEVRAssist app could also deploy VR and AR technology to support service technicians for example, or even technical tradespeople during installation work and when carrying out repairs. The digital assistance systems of this new generation result in focused learning that contributes directly to value creation.