AUTOMATICA 2014: Trade fair Robotic colleague that learns and thinks for itself

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Intelligent, cost-effective robot systems for small and medium-sized productions are designed to be intuitive and easy to operate, to learn interactively from humans and to adapt to variable production processes which are typical for small and medium-sized enterprises (SMEs). This is the vision behind the European research project SMErobotics, which is coordinated by Fraunhofer IPA. The goal is to develop technologies for adaptive robots that are easy to use, especially by small and medium-sized businesses and their agile productions. At a joint stand at the AUTOMATICA 2014 trade fair, SMErobotics will present initial prototypes from the project in various live demonstrations.
"Optimize your production: This years motto for the AUTOMATICA international trade fair for automation and mechatronics applies especially to small and medium-sized manufacturing enterprises, which, if they are to remain competitive, above all require adaptable, cost-effective automation solutions for small production runs and variable product cycles. SMErobotics creates the technological basis for intelligent, economic robotics solutions that are quick to install and easy to use. A follow-up to the successful predecessor project SMErobot, the European research initiative develops new modular, adaptive and interactive user concepts and control systems for the efficient deployment of robots. The initiative brings together leading European robot manufacturers and research institutes.
Intelligent robot systems
The goal behind SMErobotics is to augment state-of-the-art industrial robots with cognitive capabilities. The focus, therefore, is to develop novel software functions to allow robot programs to be generated from existing production data. If any data are missing or incomplete, the aim is for the robot to obtain them from the worker. "An intelligent robot system doesnt simply follow a once-given instruction. Instead, it learns intuitively and efficiently from its human operator - continuously improving its performance in collaboration with the worker, says SMErobotics coordinator Martin Hägele from Fraunhofer IPA. Various exhibits will be presented in live demonstrations at AUTOMATICA 2014.
Exhibits
The robot cells on view at AUTOMATICA 2014 will showcase examples of automation solutions for a variety of industries typical of small and medium-sized enterprises:
- Intuitive and efficient assembly: Using the KUKA LBR iiwa lightweight robot in an assembly setting for small production runs, Fraunhofer IPA will demonstrate how robots can reduce the burden on humans at manual workplaces, in addition to delivering higher throughputs also when assembling tricky components.
- Economically efficient welding even in one-off production: The sensor-controlled welding robot from Reis Robotics and Fraunhofer IPA is capable of learning from the welder. Easily and quickly reprogrammable to handle new components, it draws on previous welding experience and can thus apply old knowledge to new tasks.
- Dual-armed holding and joining of components: Taking the example of welding and assembly tasks, COMAU will for the first time demonstrate how a worker can teach the "Smart Dual Arm robot to know where to find the components and how to join them together. This enables the robot system to automatically generate the production process. Work-holding fixtures, which are typically component-specific, can largely be dispensed with.
- Easy automation: DLR and KUKA demonstrate simple and flexible automation solutions for the assembly of metal structures using the KUKA LBR iiwa lightweight robot. The shop-floor worker can "program the assembly process by just "showing the desired arrangement without the need for complex manual robot programming. The assembly process is automatically planned and converted into a robot program for execution. Intelligent skills based on the robots capabilities allow the uncertainties of a real SME environment to be addressed.
- Economically efficient "pick <br> place: DTI presents a cost-effective robot cell for general manipulation tasks (e.g. "bin picking) or for machine feeding as a "PlugnProduce system for a wide range of different production processes. This allows the profitable automation of currently manually produced small batches and variable product cycles.
- Collaborative machining: Project partners Güdel and Lund University present the skills-based portability of robot programs, including both manually written and automatically generated programs, applied to both serial and parallel kinematic robots. Interoperability between the two different types of robots is demonstrated by wood-working with real-time coordination of the arms over Ethernet, with self-calibration and robot-learning functions connected to a knowledge base for continuous improvements and reuse of task specifications.
- Intuitive interfaces: Project partner fortiss presents intuitive interfaces for human-robot interaction. Based on techniques such as augmented reality and semantic knowledge, these systems can be used without the need of expert knowledge in robotics.
- Also on show will be several software applications that both ensure economically efficient use (SME-Trainer) and provide the necessary functionalities for SME-compatible robots. This includes planners that generate robot programs as well as software modules for the intelligent integration of different automation components.
European project partners
The research initiative brings together major European robot manufacturers, system integrators and leading research institutes. The partners include the leading European robot manufacturers Comau, Güdel, KUKA and Reis und the internationally renowned universities and research institutes Lund University, Sweden; DTI Danish Technological Institute, Denmark; the fortiss Institute of Technische Universität München (TUM) and the DLR Institute for robotics and mechatronics. With this network, SMErobotics has the technological know-how to deliver high-quality solutions and new innovations in the field of robotics.
SMErobotics is coordinated by Fraunhofer IPA, one of the leading institutes for applied research. With their experience of the needs of SMEs, the industrial partners in the initiative have real-world knowledge of flexible automation requirements.
SMErobotics works closely with various SMEs, which test the developed systems under practical conditions in four technology demonstrators over the course of the project. The project partners are interested in cooperating with further SMEs that wish to contribute their experience and benefit from the latest developments.
Additional information about the project partners:
Fraunhofer IPA: www.ipa.fraunhofer.de/Robotersysteme
COMAU S.p.A.: www.comau.com
DLR - Deutsches Zentrum für Luft- und Raumfahrt e.V.: www.robotic.dlr.de
DTI - Danish Technological Institute: www.dti.dk
GPS Gesellschaft für Produktionssysteme GmbH: www.gps-stuttgart.de
GÜDEL AG: www.gudel.com
KUKA Laboratories GmbH: www.kuka-labs.com
Reis GmbH
 Co KG Maschinenfabrik: www.reisrobotics.de
fortiss - An-Institut der Technischen Universität München: www.fortiss.org
Lund University - ULUND: www.lth.se
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