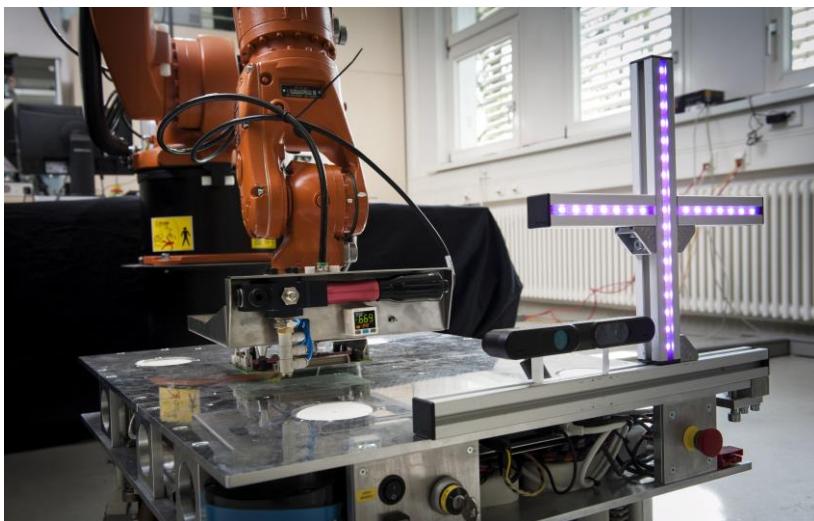


Intelligent Machines for Tomorrow's Factory

Plug & Produce Process for Efficient Manufacture of Niche Products – EU Funds SkillPro Research Project with EUR 3.8 Million



Cooperation of intelligent machines: The robot gripper hands over a workpiece to a mobile platform that moves it to the next stage. (Photo: Irina Westermann)

Mass production of industrial goods, such as furniture, clothing or ball pens, is inexpensive. In the future, even small series of individualized products might be manufactured rapidly and efficiently by means of intelligent machines that communicate with each other. To this end, researchers of the Karlsruhe Institute of Technology (KIT) coordinate the SkillPro EU research project that is aimed at finding innovative solutions to considerably reduce changeover times in the production process.

Having completed one order, manufacture of any new product ordered mostly requires a modification of the production process. When manufacturing small series, preparation, setup, and programming of the machine park often take much longer than manufacture proper. "Machines equipped with additional intelligence and communicating with each other are expected to significantly reduce the changeover time," says engineer Thomas Maier, Managing Director of KIT's Institute for Information Management in Engineering (IMI). A machine equipped with camera sensors, for instance, can recognize any workpiece even in case of changing products. Having

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examined the workpiece's shape and position, the machine can decide how to apply its gripper or suction caps and where to place the workpiece. Depending on the product, machines having gripping, welding, or bonding skills can determine their next task or production step. They "communicate" with neighboring machines and know whether they have to ask for a mobile robot to transport the product to the next workstation or the shipping department of the company.

Small and medium-sized enterprises in particular are to benefit from the intelligent production system. It allows for the low-cost production of niche products of variable shapes or fits. "The companies can offer individualized mass production and react flexibly to fluctuations in demand," Maier says. Quicker execution of small-series production will strengthen European industry production.

In the plug & produce process developed under the project, machines autonomously adjust for the product to be manufactured. The solution concept is based mainly on new developments in computer science. Prior to the start of production proper, a specially developed computer program calculates in which assembly line the orders are executed most efficiently. "Additional machines or technical capabilities can be integrated into the existing park with a small expenditure, as they inform the system about which part of the production process they will accomplish," Maier explains. The production sequence simulated in the planning phase and the real production process are displayed on a screen.

Robots and tools that communicate with each other and combine in variable factory lines within shortest periods of time are major elements of a smart factory. The factories of "Industry 4.0" combine production engineering with information technology. Under the Skill-Pro project, computer scientists cooperate with electrical engineers, business engineers, and mechanical engineers.

On the part of KIT, the Institute for Information Management in Engineering and the Institute for Anthropomatics and Robotics (IAR) with its Research Laboratory for Intelligent Process Control and Robotics (IPR) are involved in the project. "Existing plug & produce approaches are improved with the help of knowledge about the skills of new devices and their effects on the entire production system in terms of workflows and economic aspects," explains SkillPro coordinator Professor Björn Hein, who conducts research at the IPR. Apart from the KIT, the Fraunhofer Institute of Optronics, System Technologies and Image Exploitation and the FZI Research Center for Information Technology, industry partners from France, Greece,

Spain, Estonia, Finland, and Germany participate in the project. The European Union (EU) funds the research project that started in 2012 with EUR 3.8 million. The funding period will expire in September 2015. "Interim evaluation after half of the project duration confirmed the feasibility of our approach," Thomas Maier emphasizes.

Digital Press Kit Relating to the Science Year 2014

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