

# A virtual factory you can feel

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On the way to the fourth industrial revolution: Fraunhofer's miniature factory connects the real with the virtual world (photo bottom right). Credit: © Fraunhofer IGD

Industrial processes have been mechanized, electrified and digitized. In the next step they become intelligent. However, the lines between virtual and real worlds become only slowly blurred. At EuroMold in Frankfurt researchers will demonstrate leadoff Industry 4.0 applications with a miniature factory from 3 to 6 December.

Major changes to industrial plants are looming on the horizon. Customers are demanding increasingly more customized, differentiated [products](#). Manufacturers are experiencing a fourth industrial revolution: After water, steam and electric power, electronics and IT now networked sensors and simulation are moving into the factory buildings: the products of the future know where they are, know their history, their current status and the production steps that are still pending in order to arrive at a finished product. To make this possible, virtual and real world have to mesh more intensively.

## **Miniature model connects digital and real world**

At EuroMold researchers of the Fraunhofer Institute for Computer Graphics Research IGD demonstrate how one can bridge this gap. The scientists constructed a miniature factory – including a small robot that moves barrels. The researchers observed the miniature factory with a camera. With ten images per second it is constantly recording the status in the real world and transmitting these data into the virtual.

Visitors of the booth, for example, are able to plan the route for a forklift. While the virtual one moves through the continuously digitized plant hall, the system analyzes where and when a collision may arise between the forklift and a real robot. In the miniature factory, it is possible to rearrange the barrels. If the visitor sticks his hand in the path of the virtual forklift, the system immediately detects the obstruction. "This is the first step toward cyberphysical equivalency. A condition, where it is possible to switch between any real and virtual world. So far the term involves only geometric expressions. Others, such as those that include the function and behavior, are expected to follow," says Prof. André Stork, head of department at Fraunhofer IGD.

Cyber-physical equivalency, Industry 4.0 – what is exactly concealed behind this designations? "Whereas the production processes today are

centrally consolidated, with Industry 4.0, each item comes furnished with artificial intelligence, be it machine, system, workpiece or tool," adds Prof. Uwe Freiherr von Lukas, who heads the Rostock, Germany location of the Institute. In everyday terms, that means machines and robots mutually exchange information, make their own decisions and manage themselves – in conjunction with the participating human beings.

## **Manufacture low-volume production and customized products cost-effectively**

This "new" industry should secure the position of Germany and Europe as location for industry. While Asia leads in mass production by a nose, Europe's future lies in the production of customized pieces and low volume production. And this is precisely what flexible Industry 4.0 is intended to do: production lines can be redesigned and adapted so quickly that even low-volume production and customized products can be manufactured cost-effectively. Until now, business operations merely use the path from virtual to real: They plan and optimize the production lines on the computer, and then transmit them into reality. The return trip is only made rarely if at all. If something changes in the production process, this is only transferred to the virtual system on a case by case basis. "At EuroMold our miniature factory shows, that this might take a different course already today," says Freiherr von Lukas.

Provided by Fraunhofer-Gesellschaft

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