Press Release
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HOW AUTONOMOUS ROBOTS COOPERATE WITH HUMANS
Matthias Scheutz, new Principal Scientist at the AIT Austrian Institute of Technology, focuses on teamwork between humans and machines. By linking different sensor information with advanced artificial intelligence methods, the AIT is further expanding its leading position in the field of assistive and autonomous systems.

In contrast to their predecessors, modern robots are not purely work machines: The new generation perceives its environment, can react and make decisions itself. "With the new machines, the field of application of robotics has increased: autonomous systems can be used not only in industrial environments, but also as a means of transport, in disaster control or in care," emphasises Matthias Scheutz, Professor of Computer and Cognitive Sciences at Tufts University (Massachusetts, USA) and new Principal Scientist at the AIT Austrian Institute of Technology. "Like us humans, these machines sense their environment, process this information and react accordingly," says Scheutz. This is the basis for industrial robots to interact with humans and work with them in a team. The systems must be designed to serve the working human, support him, and adapt to his needs.

Powerful algorithms for machine learning
The native Austrian, who has lived in the USA since 1994 and heads the Human-Robot Interaction Laboratory at Tufts University, is particularly interested in artificial intelligence. For several years, he has been developing flexible and powerful algorithms for optimal interaction between robots and humans. Scheutz gives an example: based on the mechanisms of how humans grasp and understand processes, a robot can perceive, store, and imitate a process using step-by-step explanations. The instructions can be given verbally or through demonstrations. "This works because we have built up a potent cognitive architecture in the background with countless process descriptions, which we are constantly expanding. We develop new, powerful algorithms so that the robot can learn quickly. Since the software is platform-neutral and always based on the same system, we can use it to control different types of machines," the scientist explains.

Transatlantic research cooperation in the field of artificial intelligence
With the appointment of Matthias Scheutz as Principal Scientist at the AIT Center for Vision, Automation & Control, AIT and Tufts University have established a transatlantic research collaboration to continue to lead the way in industrial automation and digitisation. "The robots' eyes are sensors that the Center for Vision, Automation & Control develops; their brains are made up of the software we write," says Scheutz, outlining the core of the research cooperation. "The synergy of knowledge in the AI field with our centre's expertise in the focus areas of automation, control, regulation and optimisation, image processing and machine learning leads to continuous further development in the field of autonomous systems as well as in industrial production and inspection," explains Andreas Kugi, head of the Center for Vision, Automation & Control at AIT. For many years, highly specialised sensor concepts and algorithms have been

developed here, which are the basis for many automation processes. These include the lightning-fast visual quality control of banknotes or the surface of roads, the fusion of data from different sensors so that autonomous vehicles can record their surroundings in real time, or the optimisation, control and regulation of complex industrial processes and machines.

Human-machine interaction is at the centre
The technologies and methods developed at AIT support automated industrial production and inspection, for example. If production conditions change, control systems can react to this in real time and thus permanently optimise the results. Always focusing on people and their needs, the aim of the developments was and is to conserve resources and the environment, to ensure high flexibility and at the same time to be competitive.

About Matthias Scheutz
The cognitive scientist Matthias Scheutz studied philosophy and computer science in Vienna and completed his education with a doctorate at Indiana University in the USA. He is a professor of computer and cognitive sciences at Tufts University (Massachusetts, USA) and heads the Human Robot Interaction Laboratory there. Cooperations with Austrian research institutions such as the Vienna University of Technology or the Austrian Research Institute for Artificial Intelligence (OFAI) have led him back to Austria time and again. He is a member of numerous committees, such as the Boston Global Forum or the Austrian Council for Robotics and Artificial Intelligence. Since this year, he has also been a Principal Scientist at the AIT Austrian Institute of Technology. Matthias Scheutz will contribute his many years of expertise in the field of human-machine interaction to the Center for Vision, Automation & Control by implementing joint research projects and supervising PhD students.

About the Center for Vision, Automation & Control
The Center for Vision, Automation & Control (VAC) at the AIT Austrian Institute of Technology is a research unit that uses the possibilities of automation and digitalisation to initiate and drive innovations for industry. With the Institute of Automation and Control Engineering (ACIN) at the Vienna University of Technology, the centre has a leading international scientific cooperation partner in the field of systems and automation engineering. Therefore, it can accompany the entire innovation process from basic research to industrial implementation. This involves the acquisition of information by (imaging) sensor systems via sensor fusion, the combination of physically based models with concepts of machine learning and data analysis, through to the use of this information in fault detection and isolation, optimisation and control, and cognitive decisions for autonomous systems.

Further information: https://www.ait.ac.at/ueber-das-ait/center/center-for-vision- automation-control/
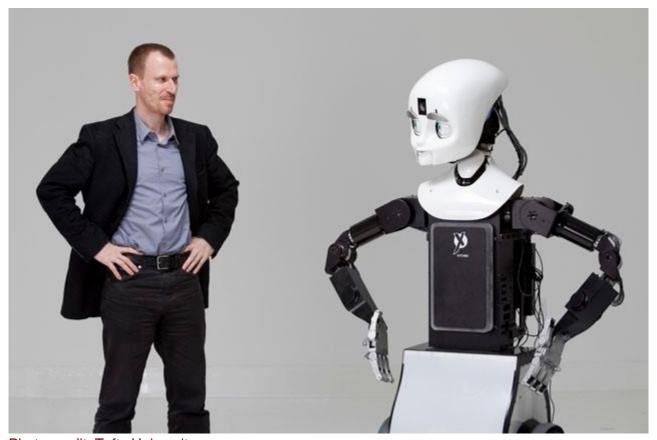
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