

Industrie 4.0: From the Internet of Things to Cyber-Physical Production Systems

Wolfgang Wahlster

CEO of the German Research Center for Artificial Intelligence (DFKI)

The Internet of Things is finding its way into production. Semantic machine-to-machine communication revolutionizes factories by decentralized control. Embedded digital product memories guide the flexible work piece flow through smart factories, so that low-volume, high-mix production is realized in a cost-efficient way. A new generation of industrial assistant systems using augmented reality and multimodal interaction will help factory workers to deal with the complexity of cyber-physical production. INDUSTRIE 4.0 is the German strategic initiative to take up a pioneering role in industrial IT that is currently revolutionizing the manufacturing engineering sector. Semantic product memories will play a key role in the upcoming fourth industrial revolution based on cyber-physical production systems. Low-cost and compact digital storage, sensors and radio modules make it possible to embed a digital memory into a product for recording all relevant events throughout the entire lifecycle of the artifact. By capturing and interpreting ambient conditions and user actions, such computationally enhanced products have a data shadow and are able to perceive and control their environment, to analyze their observations and to communicate with other smart objects and human users about their lifelog data. Cyber-physical systems and the Internet of Things lead to a disruptive change in the production architecture: the workpiece navigates through a highly instrumented smart factory and tries to find the production services that it needs in order to meet its individual product specifications stored on the product memory. We illustrate this revolutionary production architecture with examples from DFKI' Smart Factory.

Short CV of Professor Wolfgang Wahlster

Wolfgang Wahlster is the Director and CEO of the German Research Center for Artificial Intelligence (DFKI) and a Professor of Computer Science at Saarland University. He has published more than 200 technical papers and 10 books on human-computer interaction, instrumented environments, the semantic web, as well as the internet of things and services. He is an AAAI Fellow, an ECCAI Fellow, and a GI Fellow. In 2001, the President of Germany presented the German Future Prize to Professor Wahlster for his work on intelligent user interfaces, the highest personal scientific award in Germany. He was elected Foreign Member of the Royal Swedish Nobel Prize Academy of Sciences in Stockholm and Full Member of the German National Academy of Sciences Leopoldina that was founded in 1652. He has been awarded the Federal Cross of Merit, First Class of Germany. Prof. Wahlster has also been appointed member of the Research Union "Business - Science" as Chief Scientific Advisor for ICT research of the German government. He is a member of the Executive Steering Board of the EIT ICT Labs and serves on the Executive Board of the International Computer Science Institute at UC Berkeley. He is the editor of Springer's LNAI series and on the editorial board of various top international CS journals.