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TOWARDS THE COGNITIVE FACTORY

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Abstract:

Skilled human workers turn mechanical workshops into today's most flexible and widely applicable forms of production. However, this flexibility and generality come at very high production costs, which restrict the use of mechanical workshops to building prototypes and a limited range of highly specialized and valuable products. The source of flexibility in this case can be easily identified: the cognitive capabilities of the humans that operate it. Humans can perceive their environment, plan actions, learn and adapt behaviors and they can interact in multiple ways with their surroundings. Moreover, humans can do this robustly despite changing contexts and situations. The realization of comparable cognitive capabilities in technical systems therefore bears an immense potential for the creation of industrial automation systems that are able to overcome today's boundaries. The first part of this paper outlines the paradigm "Cognitive Factory", in which the machines and processes are equipped with cognitive capabilities in order to allow them to assess and increase their scope of operation autonomously. This will also allow getting closer to human operators in terms of more natural and effective ways for interaction and cooperation. To underline this vision, the second part of this paper describes selected research projects of the German cluster of excellence "Cognition in technical Systems" (CoTeSys).

Keywords:

Cognition, Flexibility, Automation, Man-machine-integration, Process Planning

Brief Biography:

Prof. Dr.-Ing. Michael Friedrich Zaeh studied mechanical engineering at the Technische Universität München. He received his doctorate in 1993 with a thesis about a dynamic process model for circular sawing. From 1994 until 1995 he was head of a department of the *iwb*. In 1996, he joined Gleason-Pfauter Maschinenfabrik GmbH, a builder of machine tools for manufacturing of gears, where he worked in the research laboratory and in the design department and then promoted to head of the order management department. He also worked on an ERP-system-implementation project. In the year 2002, he accepted the position of full professor for machine tools and manufacturing technology. Since then he has been director of the *iwb*, together with Prof. Dr.-Ing. Gunther Reinhart, chair of assembly technologies and industrial management. Michael Zaeh is associate member of CIRP, a member of acatech, the convent for technical sciences of the union of the German academies of science, of the WGP (German Scientific Society for Production Technology), of the WLT (Scientific Society of Laser Technology) as well as of several other institutions.