Application of Psychological Knowledge for Designing Usable and Adaptive Complex Systems

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Nowadays machines request their users to adapt to the characteristics of the technology. Herewith, they put a cognitive and physical burden on their user, which makes the machines less usable and less adequate for the symbiosis of technology and mankind. Hence, realizing the vision of a symbiotic society, in which humans and technical devices interact seamlessly, requires the development of new methods that enable machines to adapt to the characteristics and the specifics of each single user. Within this talk, the need for developing such methods is discussed first by introducing an evaluation study which results demonstrate that today's wheelchairs do not optimally support those in need and that the coordination between the wheelchair users and their assistive device does not run seamlessly. Second, a method of how wheelchairs can learn about their user and about its needs and a way of how wheelchairs can use this knowledge to provide a seamless and autonomous coordination of assistive devices and a disabled user is introduced and evaluated. Last, it is discussed how such a wheelchair system, which is autonomously adaptable to the characteristics and specifics of its user, can change the lives of those in need and support the creation of a symbiotic society.

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Bibliography

Dr. Meike Jipp is a postdoctoral researcher at the Automation Laboratory of the Institute of Computer Engineering at the University of Heidelberg, Germany.

In 2004 she received her M.A. degree in psychology as a major and computer science as a minor subject from the University of Mannheim, Germany. During her exchange visit as a graduate student at the Human-Oriented Technology Laboratory at the Carleton University, Ottawa, Canada she started to look into the field of human-automation system interaction. She intensified this research interest while writing her M.A. thesis. Within this scope she analysed the skill acquisition process of a surgeon applying a robotic tool when operating the human spine and identified a way of how the robot should be implemented without putting an additional cognitive burden on the surgeon.
Between 2005 and 2007 she was a doctoral fellow of Germany's state Baden-Württemberg and successfully completed her Ph.D. in 2008 with the topic "Situation Adaptation: Information Acquisition, Human Behavior and its Determining Abilities". Within the scope of her Ph.D. thesis she analysed the gaze behaviour and the operations, actions, and activities of severely disabled wheelchair users when repeatedly executing a gardening task and identified predictors for future operations, actions, and activities. Her results were applied for defining an intention estimation behaviour for assisted wheelchair control in order to ease the lives of especially severely disabled.
Since she completed her Ph.D. she has been active in the field of adapting the level of automation/autonomy of a complex computing system to the current ability level of its user in order (1) to enhance the dependability of the system and (2) to improve the usability of such systems. As demonstration platforms, she is working on a powered wheelchair system and a system for air traffic management.
Her research interests cover individual differences with regard to intelligence and working memory capacity as well as their impact when interacting with complex automation systems, skill acquisition when interacting with complex automation systems, adaptive/adaptable automation, and intention estimation.