The Human Brain Project: Chances and Challenges for Computer Science

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Abstract: Recently, the European Commission selected the Human Brain Project (HBP) as one of two Flagship projects, each receiving a prospected funding of 1 billion euro. The Human Brain Project builds on the foundations of the Blue Brain Project which was established in 2005 with the mission to integrate anatomical, electrophysiological and genetic data into a unified model of the neocortical column.

Over the course of 10 years, the HBP will create an integrated system of six ICT platforms, dedicated to Neuroinformatics, Brain Simulation, Medical Informatics, High Performance Computing, Neuromorphic Computing, and Neurorobotics. These platforms will lay the foundation for a new kind of ICT based brain research.

Three of the HBP platforms are dedicated to investigating novel, brain-derived technologies for future computers and computer science. The High-Performance Computing Platform will use brain-derived principles to design the next generation of super-computers. The Neuromorphic Computing Platform investigates how brain-derived principles can be directly embodied in new computing hardware. Finally, the Neurorobotics Platform will allow researchers to use and explore brain models in simulated closed-loop robotics experiments.

In this talk I will give an overview of the Human Brain Project. I will then describe in more detail the preparatory research for the Neurorobotics Platform, on the basis of the pioneering work of the Blue Brain Project. Along the way, I will summarize the challenges and opportunities the Human Brain Project offers to computer science.

About the speaker: Dr. Marc-Oliver Gewaltig received his Ph.D. in Physics in 1999. From 1998, he worked for the Honda Research Institute Europe in Offenbach/Main, Germany and since 2003, he served as Project Manager for Computational Neuroscience. In 2011, he joined the Blue Brain Project to head the Neurorobotics group, which aims to demonstrate the computational capabilities of the neocortical column in closed action-perception loops. He has a strong interest in the computer science and technology for large-scale neural simulations and is co-author of the neural simulation tool NEST (Gewaltig&Diesmann, 2007). For the Human Brain Project, he co-directs the Neurorobotics subproject.