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Creating Brain-Like Intelligence

From Basic Principles to Complex Intelligent Systems

Springer

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Preface

The International Symposium Creating Brain-Like Intelligence was held in February 2007 in Germany. The symposium brought together notable scientists from different backgrounds and with different expertise related to the emerging field of brain-like intelligence. Our understanding of the principles behind brain-like intelligence is still limited. After all, we have had to acknowledge that after tremendous advances in areas like neural networks, computational and artificial intelligence (a field that had just celebrated its 50 year anniversary) and fuzzy systems, we are still not able to mimic even the lower-level sensory capabilities of humans or animals. We asked what the biggest obstacles are and how we could gain ground toward a scientific understanding of the autonomy, flexibility, and robustness of intelligent biological systems as they strive to survive. New principles are usually found at the interfaces between existing disciplines, and traditional boundaries between disciplines have to be broken down to see how complex systems become simple and how the puzzle can be assembled.

During the symposium we could identify some recurring themes that pervaded many of the talks and discussions. The triad of structure, dynamics and environment, the role of the environment as an active partner in shaping systems, adaptivity on all scales (learning, development, evolution) and the amalgamation of an internal and external world in brain-like intelligence rate high among them.

Each of us is rooted in a certain community which we have to serve with the results of our research. Looking beyond our fields and working at the interfaces between established areas of research requires effort and an active process. We believe that the symposium and this volume of contributions from the symposium fueled this active process. We know that for a good endeavor there can never be too much fuel and, therefore, this symposium will certainly have its successors, as soon as we feel that the time has again arrived for enriching our own thoughts by listening to someone else's.

We would like to thank all speakers and participants for their active contribution during the symposium. The inspiring discussions during the two days and particularly in the workgroups are reflected in the chapters that are assembled in this volume. All authors who went through the extra effort to commit their thoughts shared during the symposium to paper and to merge them with their most recent research results deserve our particular gratitude. We believe the spectrum of the chapters nicely demonstrates where we currently stand in our quest for brain-like intelligence. It represents the current state of art in several research fields that are embraced by brain-like intelligence. Furthermore, it aims at connecting those research fields toward the common goal of brain-like intelligence.

Finally, we would like to thank the Honda Research Institute Europe, who organized and sponsored the 2007 symposium.

December 2008

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Olaf Sporns
Helge Ritter
Kenji Doya

Table of Contents

Creating Brain-Like Intelligence 1
Bernhard Sendhoff, Edgar Körner, and Olaf Sporns

From Complex Networks to Intelligent Systems 15
Olaf Sporns

Stochastic Dynamics in the Brain and Probabilistic Decision-Making . . . 31
Gustavo Deco and Edmund T. Rolls

Formal Tools for the Analysis of Brain-Like Structures and Dynamics 51
Jürgen Jost

Morphological Computation – Connecting Brain, Body, and Environment 66
Rolf Pfeifer and Gabriel Gómez

Trying to Grasp a Sketch of a Brain for Grasping 84
Helge Ritter, Robert Haschke, and Jochen J. Steil

Learning Actions through Imitation and Exploration: Towards Humanoid Robots That Learn from Humans 103
David B. Grimes and Rajesh P.N. Rao

Towards Learning by Interacting 139
Britta Wrede, Katharina J. Rohlfing, Marc Hanheide, and Gerhard Sagerer

Planning and Moving in Dynamic Environments: A Statistical Machine Learning Approach 151
Sethu Vijayakumar, Marc Toussaint, Giorgios Petkos, and Matthew Howard

Towards Cognitive Robotics 192
Christian Goerick

Approaches and Challenges for Cognitive Vision Systems 215
Julian Eggert and Heiko Wersing

Some Requirements for Human-Like Robots: Why the Recent Over-Emphasis on Embodiment Has Held Up Progress 248
Aaron Sloman

Co-evolution of Rewards and Meta-parameters in Embodied Evolution 278
Stefan Elfwing, Eiji Uchibe, and Kenji Doya

Active Vision for Goal-Oriented Humanoid Robot Walking 303
Mototaka Suzuki, Tommaso Gritti, and Dario Floreano

Cognitive Adequacy in Brain-Like Intelligence 314
Christoph S. Herrmann and Frank W. Ohl

Basal Ganglia Models for Autonomous Behavior Learning 328
Hiroshi Tsujino, Johane Takeuchi, and Osamu Shouno

Author Index 351