

Preface

First School on Biologically Inspired Cognitive Architectures

The emergence of biologically inspired cognitive architectures (BICA) challenges researchers across many disciplines with a new frontier: computational replication of the human mind, taken in all its essential aspects, as a functional unit of a team or a society, based on a biologically inspired approach (the BICA Challenge). After many decades of successful progress in the field of artificial intelligence, we understand now that this approach is necessary, because essential qualities of biological intelligent systems like robustness, flexibility, adaptability, communicability and teachability are still unmatched by their artificial counterparts.

This volume includes papers from the First International Early Research Career Enhancement School on Biologically Inspired Cognitive Architectures: FIERCES on BICA 2016. It is a fierce attack on the challenge, and historically, the first international school on BICA. Its mission is to facilitate interaction and collaboration among top experts in the field (including such names as Christian Lebiere, Frank Ritter, Paul Verschure) and young researchers who devoted themselves to solution of the BICA challenge, by bridging cross-disciplinary, cross-generation, and cross-cultural barriers.

Biologically Inspired Cognitive Architectures (BICA) are computational frameworks for building intelligent agents that are inspired from biological intelligence. Thanks to modern brain imaging and recording techniques allowing us to map brain structures and functions, our present ability to learn from nature how to build intelligent systems has never been greater. At the same time, new techniques developed in computer and cognitive sciences conveniently complement biological inspirations, allowing us to build the software that will unleash the presently available at low cost computational powers to their full extent. Given this situation, an explosion of intelligent applications from driverless vehicles, to augmented reality, to ubiquitous robots, is now almost certain. As a consequence, this first school on BICA is interdisciplinary in nature and promises to yield bidirectional flow of understanding between experts in all involved disciplines.

Topics of articles included in this volume extensively cover the most advanced scientific fields relevant to BICA that are traditionally considered at the international level of significance and discussed at many mainstream national and international conferences on artificial intelligence, neuroscience, and cognitive modeling, including conferences organized by the Russian Association of Artificial Intelligence (RAAI) and by the BICA Society. The list of the latter is quite long. Beginning with the AAAI Fall Symposia on BICA (2008, 2009), the Annual International Conference on BICA has been held every year since 2010, demonstrating progressively growing popularity. Locations of the conference included Arlington, Virginia (near Washington, DC, 2010); Palermo, Italy (2012); Kiev, Ukraine (2013); Cambridge, Massachusetts (2014); Lyon, France (2015); and upcoming this year—New York, USA (2016). The present BICA event, however, is unique in its kind.

Specifically, papers included in this volume are a mixture of tutorials and research articles, focused on fundamental and applied areas of cognitive, social and neurosciences and artificial intelligence, including, but not limited, to topics such as cognitive modeling, automated planning and behavior generation, fuzzy models and soft computing, knowledge engineering, ontologies and knowledge management, acquisition, representation and processing of temporal knowledge, applied intelligent systems, dynamic intelligent systems and real-time systems, intelligent tutoring systems, instrumental systems for artificial intelligence. All works included in this volume have been carefully peer-reviewed and refereed, and reflect the high level of ongoing research and development in participating leading universities and research centers around the world, including those in the US, France, Germany, Italy, Spain, Japan, Ukraine, Belarus, and also in Russia (Moscow, St. Petersburg and other Russian cities).

We are grateful to all authors who contributed their works to this volume. We also would like to express our many thanks to all people who helped us with the organization of the first school FIERCES on BICA, primarily including Drs. Aleksandr I. Panov, Olga A. Mishulina, Vladimir G. Redko, Galina A. Beskhlebnova, Ilya Sukonkin, and Ms. Olga N. Petukhova. Last, but not the least, is our appreciation and acknowledgment of the sponsors of FIERCES on BICA. Financial sponsorship was provided by the Russian Science Foundation (Grant No 15-11-30014 to Dr. Alexei V. Samsonovich). Organizational support was provided by Department of Cybernetics of the National Research Nuclear University MEPhI (Moscow Engineering Physics Institute): <https://mephi.ru/eng/about/departments/22.php>, with the help of BICA Society (<http://bicasociety.org>).

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