Preface

These proceedings contain the papers presented at the 2009 NASA/ESA Conference on Adaptive Hardware and Systems (AHS 2009), held at the Moscone Convention Center, San Francisco, California, USA, between July 29 – August 1, 2009. The purpose of the AHS 2009 conference is to bring together leading researchers from the adaptive hardware and systems community to exchange experiences and share new ideas in the field.

Adaptation reflects the capability of a system to maintain or improve its performance in the context of internal or external changes, such as uncertainties and variations during fabrication, faults and degradations, modifications in the operational environment, incidental or intentional interference, different users and preferences, modifications of standards and requirements, trade-offs between performance and resources, etc.

Adaptation at hardware levels increases the system capabilities beyond what is possible with software-only solutions, and a large number of adaptation features employing both analog and digital adjustments are becoming increasingly present in the most elementary system components. Algorithms, techniques, and their implementation in hardware are developed over a diverse variety of applications, such as adaptive communications (adapting to changing environment and interferences), reconfigurable systems on a chip and portable wireless devices (adapting to power limitations) or survivable spacecraft (adapting to extreme environments and mission unknowns).

The papers presented during the conference spanned many issues: fundamentals and theory, state-of-the-art adaptive technology in the area of analog/digital/mixed circuits, reconfigurable devices, fault-tolerant and self-repair systems, embryonic hardware and morphogenesis.

The year 2009 marks the bicentenary of Charles Robert Darwin's birth and the 150th anniversary of the publication of his ground breaking book “On the Origin of Species by Means of Natural Selection, or The Preservation of Favoured Races in the Struggle for Life”. His concept of the evolution of species by natural selection has not only changed the view of the human race on its the origins but has also found its way into technology through the application of evolutionary and related algorithms to automate design the adaptation of physical, reconfigurable, and morphable structures such as electronic and digital systems, antennas, MEMS and robots.

A number of invited and special sessions were organized. These included invited and regular papers in emerging and/or key topics such as “Emerging Computer Technologies for Adaptive Systems” and “Reconfigurable and Adaptive Multiprocessor Systems-on-Chip”.

We would like to acknowledge the support and hard work of the many individuals who made AHS 2009 a reality. First, we thank the authors and the invited speakers for their high-quality contributions. We express our gratitude to the Program Committee for their gracious assistance in the refereeing process. We thank our organizers: the NASA Jet Propulsion Laboratory, the European Space Agency, and the University of Edinburgh.

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Martin Suess, European Space Agency, Netherlands (General Chair)
Tughrul Arslan, University of Edinburgh, UK (Vice General Co-Chair)
Didier Keymeulen, Jet Propulsion Laboratory, USA (Vice General Co-Chair)
Ahmet T. Erdogan, University of Edinburgh, UK (Technical Program Chair)
David Merodio, European Space Agency, Netherlands (Technical Program Co-Chair)
Adrian Stoica, Jet Propulsion Laboratory, USA (Steering Committee Chair)