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Artificial Evolution

10th International Conference
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Revised Selected Papers

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Preface

This LNCS volume includes the best papers presented at the 10th Biennial International Conference on Artificial Evolution, EA[1] 2011, held in Angers (France). Previous EA editions took place in Strasbourg (2009), Tours (2007), Lille (2005), Marseille (2003), Le Creusot (2001), Dunkerque (1999), Nimes (1997), Brest (1995), and Toulouse (1994).

Authors had been invited to present original work relevant to artificial evolution, including, but not limited to: evolutionary computation, evolutionary optimization, co-evolution, artificial life, population dynamics, theory, algorithmics and modeling, implementations, application of evolutionary paradigms to the real world (industry, biosciences), other biologically inspired paradigms (swarm, artificial ants, artificial immune systems, cultural algorithms), memetic algorithms, multi-objective optimization, constraint handling, parallel algorithms, dynamic optimization, machine learning and hybridization with other soft computing techniques.

Each submitted paper was reviewed by three members of the International Program Committee. Among the 64 submissions received, 33 papers were selected for oral presentation and 10 other papers for poster presentation. As for the previous editions (see LNCS volumes 1063, 1363, 1829, 2310, 2936, 3871, 4926 and 5975), a selection of the best papers (19 papers, hence an acceptance rate of less than 30%) which were presented at the conference and further revised is published in this volume of Springer's LNCS series.

To celebrate the tenth anniversary of EA, we are grateful to two of the cofounders of the EA series, Evelyne Lutton and Marc Schoenauer both from INRIA (France), who accepted to give a talk on "Twenty Years of Artificial Evolution in France" (Jean-Marc Alliot from ENAC Toulouse is the other cofounder). We would also like to express our sincere gratitude to our invited speaker René Doursat from Institut des Systèmes Complexes – Paris, who gave the talk "Artificial Evo-Devo: Bringing Back Self-Organized Multi-Agent Systems into Evolutionary Computation."

The success of the conference resulted from the input of many people to whom we would like to express our appreciation: the members of Program Committee for their careful reviews that ensure the quality of the selected papers and the conference; the members of the Organizing Committee for their efficient work and dedication assisted by Catherine Pawlonski-Boisseau and Christine Bardaine and others from the Computer Science Department of the University of Angers; the members of the Steering Committee for their valuable assistance; Sylvie Reverdy from Centre de Congrès d'Angers for her very efficient actions; and Marc Schoenauer for his support with the MyReview system.

[1] As for previous editions of the conference, the EA acronym is based on the original French name "Évolution Artificielle."

We take this opportunity to thank the different partners whose financial and material support contributed to the organization of the conference: Université d'Angers, Conseil Général "Maine et Loire", Ville d'Angers, Angers Loire Métropole, Région "Pays de La Loire", INRIA, Ministère de l'Enseignement Supérieur et de la Recherche, Laboratoire LERIA, Centre de Congrès d'Angers.

Last but not least, we thank all the authors who submitted their research papers to the conference, the authors of accepted papers who attended the conference to present their work, and the attendees. Thank you all.

July 2012

Jin-Kao Hao
Pierrick Legrand
Pierre Collet
Nicolas Monmarché
Evelyne Lutton
Marc Schoenauer

Photo by Nicolas Monmarché.

Évolution Artificielle 2011 – EA 2011

October 24–26, 2011
Angers, France
10th International Conference on Artificial Evolution

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Invited Talks

1 - René Doursat, Institut des Systèmes Complexes - Paris (France)

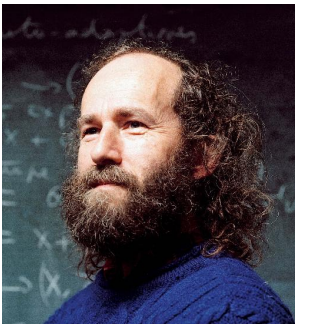
Artificial Evo-Devo: Bringing Back Self-Organized Multi-Agent Systems into Evolutionary Computation

Multicellular organisms and social insect constructions are rather unique examples of naturally evolved systems that exhibit both self-organization and a strong architecture. Can we export their precise self-formation capabilities to technological systems ? I have proposed a new research field called "morphogenetic engineering" [1], which explores the artificial design and implementation of complex, heterogeneous morphologies capable of developing without central planning or external lead. Particular emphasis is set on the programmability and controllability of self-organization, properties that are often underappreciated in complex systems science, while, conversely, the benefits of multi-agent self-organization are often underappreciated in engineering methodologies, including evolutionary computation. In this talk I presented various examples of morphogenetic engineering, in particular multi-agent systems inspired by biological development based on gene regulation networks, and self-construction of graph topologies based on "programmed attachment" rules. Potential applications range from robotic swarms to autonomic networks and socio-technical systems. In all cases, the challenge is to "meta-design," especially through an evolutionary search, the proper set of rules followed by each agent of a complex system on how to interact with the other agents and the environment. Whether "offline" (slow time scale), where agents always share the same genotype, or "online" (fast time scale), where agent types may diverge and specialize dynamically, it constitutes an inherently massively parallel "artificial evo-devo" (evolutionary developmental) problem.

[1]. Doursat, R., Sayama, H. and Michel, O., eds. (2011) Morphogenetic Engineering: Toward Programmable Complex Systems, in NECSI "Studies on Complexity" Series, Springer-Verlag, in press.

2 - Evelyne Lutton and Marc Schoenauer, INRIA (France)

Twenty Years of Artificial Evolution in France



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