

IEEE Transactions on Evolutionary Computation

Special Issue on Evolving Developmental Systems

I. AIM AND SCOPE

COMPUTATIONAL modeling of biological development has received increasing interest in evolutionary computation, artificial life and computational systems biology. In the evolutionary computation community, evolutionary algorithms using an indirect coding or generative coding are believed to be more scalable in evolving highly complex systems, compared to those using a direct coding. The scalability of such developmental systems can mainly be attributed to the fact that the genetic information in the genotype can be reused more than once during the developmental process and that many constraints, particularly environmental constraints, can be incorporated in the phenotype without explicit encoding. On the other hand, due to the nonlinear nature of the genotype-phenotype mapping of such indirect or generative representations, the efficiency of evolutionary search may seriously degrade.

A large body of research work on computational developmental systems has also originated from the need to modeling the early development of the body plan and nervous systems in artificial life research. Developmental models in different research may have quite different abstraction-levels of biological development, ranging from a set of re-writing rules to gene regulatory network model including metabolic reactions. In particular, developmental models based on the early morphogenesis of multi-cellular organisms have shown several attractive properties such as self-organization and self-repair. These systems have been applied successfully to solving engineering problems such as circuit design and multi-robot systems. With the recent rapid advances in systems biology and bioinformatics, understanding of developmental processes in biology has been enhanced greatly, which will definitely promote research on developmental systems in evolutionary computation and artificial life.

II. THEMES

This special issue aims to promote a strong interdisciplinary integration of expertise from researchers in evolutionary computation, artificial life as well as computational biology. Topics include but are not limited to:

- Scalable evolutionary algorithms using indirect or generative encoding
- Evolution of body plans and / or nervous systems using a developmental approach
- Self-organizing systems based on genetic and cellular mechanisms
- Developmental approaches to engineering design, e.g., circuits design and structural design
- Analysis of evolvability and robustness of developmental systems
- Evolving gene regulatory networks

- Benchmarking evolutionary developmental systems

III. SUBMISSION

Manuscripts should be prepared according to the “Information for Authors” section of the journal found at <http://ieeecs.org/pubs/tec/authors/> and submissions should be done through the journal website: <http://mc.manuscriptcentral.com/tevc-ieee/> clearly marking “**EDS Special Issue Paper**” as comments to the Editor-in-Chief.

Submitted papers will be reviewed by at least three different expert reviewers. Submission of a manuscript implies that it is the authors’ original unpublished work and is not being submitted for possible publication elsewhere.

IV. IMPORTANT DATES

April 30, 2010: Submission deadline
August 31, 2010: Notification of the first round review
October 31, 2010: Revision due
December 31, 2010: Final notice of acceptance / reject
February 3, 2011: Final manuscript due

The expected publication of the special issue is mid-2011.

Please pass this information on to interested colleagues. For further information, contact one of the following guest editors.

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