Special Issue of the Natural Computing journal

Interaction between Computation and Biology

Submission Deadline: October 31st 2009

Scope

The relationship between biology and computing in research has a long and rich history. This special issue of the Natural Computing journal explores this relationship focussing on the interactions between computation and biology, and the benefits to each field this interaction brings.

Approaches that combine elements of computing and biology typically fall into one of two categories: the use of biological metaphors to influence the design of software and hardware in computer systems (*bio-inspired computing*); and the use of computing tools and methods to model, simulate and investigate biological systems (*computational biology*). These approaches are often driven by different motivations. Bio-inspired approaches aim to capture problem solving strategies observed in nature for use in engineering systems, whereas computational biology methods aim to understand aspects of a biological system.

Within the natural world a vast array of strategies exist to solve problems and facilitate life. The inspiration this biology provides to the computer engineer has resulted in a broad range of bio-inspired computing paradigms and techniques, which have been applied to a vast range of computational problems. Examples of these techniques include: evolutionary computation and genetic algorithms; artificial neural networks; artificial life models; swarm intelligence; DNA computing; and artificial immune systems.

A broad array of computational techniques can be applied to investigating biological systems and problems. These range from the more mathematical and formal approaches to diagramatic and agent-based approaches. Examples of the former include process calculi, which are formal languages used to specify concurrency systems, an inherent property of biology systems. Diagrammatic modelling languages such as the unified modelling language (UML) provide a language for capturing and specifying both biological relationships and structure. Agent-based techniques allow each of the components of a biological system to be represented explicitly and individually, making them suitable to study emergence in biological systems.

Papers submitted to this special issue should describe either applications of bio-inspired computing approaches or applications of computing techniques to biological investigations. We are especially interested in submissions that apply bio-inspired approaches to biological problems, whether or not the biological system under investigation is the same as the inspiring approach used.

Selected Topics of Interest

- ✓ Application of bio-inspired systems to real-world engineering problems
- ✓ Development of novel bio-inspired approaches
- ✓ Use of computational or mathematical modelling to understand biological systems
- ✓ Application of bio-inspired systems to biological problems
- ✓ Perspectives on the interdisciplinary interaction of computation and biology

Paper Submission

All manuscripts must be prepared according to the publication guidelines of the Natural Computing Journal that can be found at the journal website: `http://www.springer.com/computer/foundations/journal/11047`

Prospective authors are invited to submit their papers using the online submission system of the journal at `http://www.editorialmanager.com/naco` selecting "Spec. Issue on Art. Immune Systems" as the article type.

When submitting a paper, please also inform Jon Timmis about the submission by sending an e-mail to `jtimmis@cs.york.ac.uk` with the paper title and author list.

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Important Dates

Manuscript due:	October	31, 2009
Notification:	January	10, 2010
Final manuscript due:	February	11, 2010