

## Special Issue on Mathematics and Algorithms of Social Interactions

With papers arising from *The Second International Workshop on the Mathematics and Algorithms of Social Insects*

### Guest Editorial

In recent years, there has been an increasing degree of collaboration among biologists, mathematicians and computer scientists looking at the commonalities between insect societies and collective robotics. Dramatic advances in experimentation, mathematical modeling and computer simulation have deepened our understanding of collective, often self-organized, phenomena in insect societies and have provided a rich source of inspiration for computer scientists working in areas such as planning, logistics and most notably collective robotics. Conversely, computer scientists, whether validating proposed proximate mechanisms and algorithms in their implementations, providing new automated data capture and analysis tools, or exploring new ideas about what can or cannot work in distributed problem solving, have been increasingly influential to sociobiologists in how they view and understand their systems. The time was thus ripe for an interdisciplinary workshop to foster such collaborations and flow of ideas.

As such, the *Second International Workshop on the Mathematics and Algorithms of Social Insects* (MASI'03) was held on the campus of the Georgia Institute of Technology, Atlanta, in December 2003. (The first workshop of this series was held at the Isaac Newton Institute, Cambridge, UK in December 2001.) Attending was an impressive collection of mathemati-

cians, computer scientists and biologists, as well as some engineers, psychologists, and industry consultants; and they came from near and far: All across the US, Europe, and even as far as Singapore. What ensued were two fascinating days as researchers told each other of their work, played human swarming games and instigated useful discussion and subsequent collaborations.

Despite the title, this workshop was not devoted to insect societies, rather it was more about multi-agent systems, collective behavior and distributed problem solving, a fact reflected by the different session titles: Biologically inspired robotics and algorithms, social robot behavior (I–II), computer science applied to biology, social animal behavior (I–III), and swarm intelligence.

What you will find in this special issue (which we are extremely grateful to *Adaptive Behavior* for hosting) is some of the best work presented at MASI'03. These papers were chosen not only for the quality of the work, but also as some of the most interdisciplinary; in short, those with the most actual or potential transferable knowledge, insights or techniques. Several major themes became apparent at MASI'03: Collaborative, parallel experiments in biological and non-biological systems (see especially the papers of Scholes et al., and Joshi & Schank), common approaches, metrics and language (see papers by Anderson, Lerman, Li et al., Scholes et al. and Ulam

& Balch), and bio-inspired algorithms in computational systems (see Nakrani & Tovey). In addition, we include some important work on an automated behavior classification tool (see Feldman & Balch), the dynamics of labor division in a threshold response system (see Merkle & Middendorf), and a simulation that explores the economics of honey bee foraging in a fluctuating environment (see Schmickl & Crailsheim).

Finally, we would like to thank the large number of people and components that helped make MASI'03 such an outstanding success. First and foremost, we are extremely grateful to the National Science Foundation whose financial support helped fund the attend-

ance of a significant number of graduate students, and some faculty, at the workshop. The College of Computing and the staff and students of the BORG lab and the GVU at Georgia Tech all provided invaluable local organizational and logistical support. The program committee and reviewers, both for the conference proceedings and this special issue, helped formulate a fascinating, high quality program and set of papers. And, the plenary speakers—Ronald Arkin, Eric Bonabeau, and Guy Theraulaz—gave excellent, inspiring presentations. We thank you all and hope to see you again at the third MASI workshop likely to be held in Europe in 2005.

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