Editorial

**Meng-Hiot Lim · Steven Gustafson ·
Natalio Krasnogor · Yew-Soon Ong**

Published online: 1 October 2009
© Springer-Verlag 2009

The aim of this journal is to capture the growing research trends in Memetic Computing. The goals of this journal are thus:

1. To be an outlet of high quality research in hybrid meta-heuristics for optimization, control and design in continuous and discrete optimization domains.
2. To go beyond current search methodologies towards innovative research on the emergence of cultural artifacts.
3. To serve as a focal publication where the latest results in Natural Computation, Artificial Intelligence, Machine Learning, Operational Research, exact and approximate optimization and Natural Sciences are combined together in novel ways.

First, some comments about the second issue.

It was emphasized in the editorial of the first issue that successful search and optimization applications to real-world, complex problems typically depend on one or more methods. In the second issue, it was therefore befitting to have two application-focused papers to demonstrate the potential of memetic approaches. The paper by Ferrante and Tirronen

presents a simple, but effective, self-adaptive augmentation to the Differential Evolution optimization technique. Several local search algorithms work to improve the generation of new solutions during the evolutionary search process. The paper by Aranha and Iba presents a new representation for the portfolio optimization problem. A memetic approach utilizes a tree-based genetic algorithm to represent a portfolio of assets, where the relationships between assets can be learned while local search algorithms continue to fine-tune system parameters.

One of the challenges with developing memetic approaches is the difficulty in understanding the interaction of the individual components of the search and optimization methods. Two papers in the second issue address the algorithm dynamics in memetic approaches with promising results and analysis methodologies. In the paper by Fischer, Bauer, and Merz, a thorough consideration is given to the individual memetic algorithm components. The paper demonstrates both a very promising approach to the Routing and Wavelength Assignment problem as well as an exemplary analysis of how the various factors of problem representation and algorithm decisions interact during search and optimization. The paper by Whitacre, Sarker and Pham analyzes the impact of various solutions in population-based algorithms with the concept of Event Takeover Value in the search trajectory. Their novel analysis utilizes a macro-scopic measure of individual solution impact on the overall search trajectory to determine whether a particular representation and problem are likely to be overly influenced by single solutions during search.

Lastly, a particularly appropriate problem for memetic approaches is the solving of problems that are themselves inherently hierarchical. The first paper of the second issue addresses this opportunity in the domain of learning problems. The paper by Meuth et al. discusses the history of

M.-H. Lim (✉) · Y.-S. Ong
Nanyang Technological University, Singapore, Singapore
e-mail: emhlim@ntu.edu.sg

Y.-S. Ong
e-mail: asysong@ntu.edu.sg

S. Gustafson
GE Global Research, Niskayuna, NY, USA
e-mail: steven.gustafson@research.ge.com

N. Krasnogor
University of Nottingham, Nottingham, UK
e-mail: Natalio.Krasnogor@nottingham.ac.uk

various memetic approaches, from the simple pairing of local and global search to a potential future where brain-inspired systems include explicit mechanisms for recognition, generalization, memory and optimization. The paper presents three examples familiar to the community to demonstrate the concept of learning across problem instances and problems themselves.

In this current issue of *Memetic Computing* journal, we continue to build upon the very strong first and second issue published earlier this year. We selected four research papers plus a short technical paper that are demonstrative of our commitment to the goals of this journal.

The first paper in this issue is by Le et al. serves as a clear illustration of the needs for further theoretical analysis on MA approaches. Here the notion of local optimum structure and connectivity structure are introduced in the context of Lamarckian learning to facilitate the analysis of performance from the standpoint of solution quality and computational efficiency of search operators. We believe that more research along this avenue is warranted.

Tabu search is known to be an effective candidate for hybridization with genetic algorithms. Ting et al., paper shows that elements of tabu search can be integrated into a genetic survival selection operation to produce desirable effect of balancing selection pressure and diversity. We view this paper as suggestive evidence of deeper investigative research work required along the path of hybridization.

Bader-El-Den et al. introduces a grammar-based genetic programming approach for evolving constructive heuristics for exam timetabling. This work draws out the clear link

between memetic algorithms and hyperheuristics from the perspective of memes. The application in timetabling is most appropriate in illustrating that memes are not static entities during a search process, but rather can subject to domain or problem-specific higher order adaptation and transformative behavior.

In fuzzy logic, membership functions play an important role. This issue includes a paper by Morikawa et al. outlining two approaches of tuning membership functions for kernel fuzzy classifiers based on support vector machine (SVM) training. This is very much in the spirit of the journal's motivations, a clear indication that *Memetic Computing* can extend towards the interplay of fuzzy and SVM techniques in problem-solving.

Finally, a short technical letter on axiomatic engineering design offers interesting insights into how specifications of optimum design can be formulated based on basic engineering mechanics and goals in terms of fuzzy concepts. In their work, Martikka and Pöllänen used the industrial case study of a flange plate design to show the potential benefits of cost savings and innovative design solutions.

We thank the authors for continuing to submit excellent work to the journal. We are grateful for our editorial board and reviewers who performed the review process in a timely manner while contributing feedback and criticisms that further improved the submissions. We look forward to receiving additional research articles on the theoretical and applied areas of memetic computing, as well as those articles focused on one of many of our upcoming thematic issues.