

IEEE WCCI 2010
Jul 18, 2010 - Jul 23, 2010, Barcelona, Spain
Special Session on
‘Hybrid Evolutionary Algorithms, Hyper-Heuristics and Memetic Computation’

Special Session Objectives and Topics

Learning and adaptation represent key components in the design of modern effective and generally applicable search methodologies. These components can be incorporated into more traditionally techniques in many forms. Memetic algorithms (MAs) are a class of population-based hybrid evolutionary algorithms (EAs) coupled with a learning procedure capable of performing refinements. They have become one of the successful computational intelligence methodologies in current use today. Despite this inarguable success, hybrid EAs may not represent the full realization of memetic computation. Although they encompass cultural evolution (in the form of local refinement) in the search cycle, they lack a complete incorporation of core principles such as memetic *transmission*, *variation* and *selection*. The definition of the word “meme” has remained multi-faceted in the field of computational intelligence. Memes have materialized both as information restricted to the brain as well as available in the form of behaviors and artifacts. Some researchers have looked upon memes as “ideas & knowledge”, “synapses in neural memory networks”, “memory items & abstractions”, “laterally/hierarchically organized semantic memory”, “information/neural patterns that infect human minds” and others. More recently, the full realization on the notion of ‘memes’ that are close to evolutionary principles has gathered pace within the memetic computing community; memes can be seen as evolvable strategies for problem solving, thus extending the notion of a fixed problem domain knowledge component captured at design time and left untouched.

Hyper-heuristics have emerged as a class of search methodologies that share some goals with memetic computation. In particular, they are concerned with automating the design of heuristic methods to solve hard computational search problems. An underlying strategic research challenge is to develop more generally applicable (adaptive) techniques. Hyper-heuristic research encompasses automated *heuristic selection* and automated *heuristic generation* methodologies. They generally incorporate learning mechanisms or search on a space of heuristics (or its components). They are not always population-based approaches, but also can be based on single-point search, and can incorporate constructive heuristics beside perturbation heuristics.

The aim of this special session is to bring together researchers and practitioners in hybrid evolutionary algorithms, hyper-heuristics and memetic computation; in order to learn from each other, develop common understandings, and inspire new algorithms and approaches. Special emphasis will be given to adaptive approaches that balance the trade-off between global and local search (diversification/intensification) within a coordinated framework. In addition, diverse state-of-the-art concepts, theory, and practice of memetic computation and hyper-heuristics are also welcomed.

Topics of interest of this special session are:

- balancing global and local search (or diversification/intensification)
- (self-) adaptive coordination of local search and/or other heuristics
- multi-agent and cooperative approaches
- formal and probabilistic single/multi-objective approaches
- automated generation of heuristics or its components
- approaches that mimics individual learning, social learning and imitation
- coevolution of genes and memes
- memes, memplexes, meta-memes in computing and high-order evolution
- applications to dynamic and noisy environments
- applications to computationally expensive and large scale optimization problems
- real-world problem domains

Special Session Organizers:

Gabriela Ochoa, University of Nottingham, United Kingdom
Shaheen Fatima, Loughborough University, United Kingdom
Ferrante Neri, University of Jyväskylä, Finland
Yew-Soon Ong, Nanyang Technological University, Singapore

Tentative papers and authors:

There will be an open call for papers (according to the tradition of this special session) and the most relevant works will be selected.