

DISTRIBUTED, PARALLEL AND CLOUD METAHEURISTICS

Simone Ludwig and J.J. Merelo

Parallel and distributed computing systems have come a long way from specialized big-scale computer systems such as Grids and clusters. Nowadays, multi-core processing is present in our desktop systems and smartphones as well as other mod cons. Parallel and distributed computing systems have also moved from being permanent, physical and synchronized systems to being used in an ad hoc, temporal and virtual (cloud) asynchronous manner. Thus, the adaptation of evolutionary algorithms of any kind to these environments presents unique challenges from many points of views: from the purely theoretical that studies the influence of different types of communication among populations, to the practical that intends to predict the performance of the parallel system or apply it to a particular problem.

This special session aims at fostering the cross-fertilization of knowledge between evolutionary algorithms, or metaheuristics in general, and parallel, distributed and concurrent computing. Working in two domains of research can be hard, but the cross-fertilization might be fruitful. Knowledge about parallel computing helps in creating parallel algorithms for clouds, multi-core or GPU architectures. However, this also implies the need for a careful definition of proper benchmarks, software tools, and metrics to measure the behavior of algorithms in a meaningful way. In concrete, a conceptual separation between physical parallelism and decentralized algorithms (whether implemented in parallel or not) is needed to better analyze the resulting algorithms.

This special session is expected to collect contributions, from the theory through the implementation, to the application of techniques born from the crossover with metaheuristics of the traditional research fields in parallel computing. Articles are solicited, that describe significant and methodologically well-founded contributions to problem solving, aimed at maximizing both efficiency and accuracy.

This special session includes topics concerning the design, implementation, and application of parallel evolutionary algorithms, as well as metaheuristics in general: GA, ACO, PSO, VNS, SS, SA, EDA, TS, ES, GP, GRASP, etc.

Topics

- Parallel/distributed/concurrent evolutionary, memetic, multiobjective, dynamic
- algorithms and metaheuristics
- Parallel/distributed/concurrent (PDC) computing models
- Hardware realizations of these models
- PDC realizations: cloud, P2P, browser-based, socket-based, mobile
- Algorithms and tools for helping in designing new parallel algorithms
- PDC software frameworks/libraries
- PDC test benchmarks
- Performance evaluation
- Theory of PDC evolutionary algorithms and metaheuristics
- Big data and cloud computing
- MapReduce implementations of evolutionary computation or swarm intelligence
- approaches
- Real-world applications