LARGE SCALE GLOBAL OPTIMIZATION

Daniel Molina, Swagatam Das, Antonio La Torre and Nabi Omidvar

In the past two decades, many nature-inspired and evolutionary algorithms (EAs) have been developed and applied successfully for solving a wide range of optimization problems, including Simulated Annealing, Evolutionary Algorithms, Differential Evolution, Particle Swarm Optimization,Ant Colony Optimization, Artificial Bee Colonyy, ... Although these techniques have shown excellent search capabilities when applied to small or medium sized problems, they still encounter serious challenges when applied to large scale problems, i.e., problems with several hundreds to thousands of variables. The reasons appear to be two-fold. Firstly, the complexity of a problem usually increases with the increasing number of decision variables, constraints, or objectives (for multi-objective optimization problems), which may prevent a previously successful search strategy from locating the optimal solutions. Secondly, as the size of the solution space of the problem grows exponentially with the increasing number of decision variables, there is an urgent need to develop more effective and efficient search strategies to better explore this vast solution space with a limited computational budget.

In recent years, researches on scaling up EAs to large scale problems have attracted much attention, including both theoretical and practical studies. Existing work on this topic are still however rather limited, given the significance of the scalability issue. This special session is devoted to highlight the recent advances in EAs for handling large scale global optimization (LSGO) problems, involving single or multiple objectives problems, unconstrained or constrained search spaces and binary/discrete, real, or mixed decision variables.

Furthermore, a companion competition on Large Scale Global Optimization will also be organized in conjunction with the special session. The aim of the competition is to allow researchers to run their algorithms on a prefixed benchmark of functions to allow fair comparison of the results. We are currently working on a new benchmark specifically designed for this competition. Once it is available it will be announced on the web site of the special session. As an alternative, researchers can also use benchmarks proposed for previous editions of the competition.
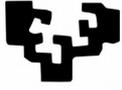
Topics

- Theoretical and experimental analysis of the scalability of EAs

- Improvement of the scalability of EAs by parallel implementations or specific architectures (such as GPUs)

- Novel approaches and algorithms for scaling up EAs to large scale optimization problems

- Applications of EAs to real-world large scale optimization problems

- Novel test suites that help us to understand large scale optimization problem characteristics

- New grouping approaches for cooperative coevolution

- Specialized algorithms for large scale optimization