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SPECIAL
SESSIONS

BRAIN STORM OPTIMIZATION ALGORITHMS

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Swarm intelligence algorithm should have two kinds of ability: capability learning and capacity developing. The capacity developing focuses on moving the algorithm's search to the area(s) where higher search potential may be obtained, while the capability learning focuses on its actually search from the current solution for single point based optimization algorithms and from the current population for population-based swarm intelligence algorithms. The swarm intelligence algorithms with both capability learning and capacity developing can be called as developmental swarm intelligence algorithms.

The capacity developing is a top-level learning or macro-level learning methodology. The capacity developing describes the learning ability of an algorithm to adaptively change its parameters, structures, and/or its learning potential according to the search states of the problem to be solved. In other words, the capacity developing is the search strength possessed by an algorithm. The capability learning is a bottom-level learning or micro-level learning. The capability learning describes the ability for an algorithm to find better solution(s) from current solution(s) with the learning capacity it possesses.

The Brain Storm Optimization (BSO) algorithm is a new kind of swarm intelligence, which is based on the collective behaviour of human being, that is, the brainstorming process. It is natural to expect that an optimization algorithm based on human collective behaviour could be a better optimization algorithm than existing swarm intelligence algorithms which are based on collective behaviour of simple insects, because human beings are social animals and are the most intelligent animals in the world. The designed optimization algorithm will naturally have the capability of both convergence and divergence.

The BSO algorithm is a good example of developmental swarm intelligence algorithm. A "good enough" optimum could be obtained through solution divergence and convergence in the search space. In the BSO algorithm, the solutions are clustered into several categories, and the new solutions are generated by the mutation of cluster or existing solutions. The capacity developing, i.e., the adaptation during the search, is another common feature of the BSO algorithms.

The BSO algorithm can be seen as a combination of swarm intelligence and data mining techniques. Every individual in the brain storm optimization algorithm is not a solution to the problem to be optimized, but also a data point to reveal the landscapes of the problem. The

swarm intelligence and data mining techniques can be combined to produce benefits above and beyond what either method could achieve alone.

This special session aims at presenting the latest developments of BSO algorithm, as well as exchanging new ideas and discussing the future directions of developmental swarm intelligence. Original contributions that provide novel theories, frameworks, and applications to algorithms are very welcome for this Special Session.

Topics

- Analysis and control of BSO parameters

- Parallelized and distributed realizations of BSO algorithms

- BSO for Multimodal optimization

- BSO for Multi-objective optimization

- BSO for Constrained optimization

- BSO for Discrete optimization

- BSO algorithm with data mining techniques

- BSO in uncertain environments

- Theoretical aspects of BSO algorithm

- BSO for Real-world applications