DIFFERENTIAL EVOLUTION: PAST, PRESENT AND FUTURE

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Differential evolution (DE) emerged as a simple and powerful stochastic real-parameter optimizer two decades ago and has now developed into one of the most promising research areas in the field of evolutionary computation. The success of DE has been ubiquitously evidenced in various problem domains, e.g., continuous, combinatorial, mixed continuous-discrete, single-objective, multi-objective, constrained, large-scale, multimodal, dynamic and uncertain optimization problems. Furthermore, the remarkable efficacy of DE in real-world applications significantly boosts its popularity.

Over the past decades, numerous studies on DE have been carried out to improve the performance of DE, to give a theoretical explanation of the behavior of DE, to apply DE and its derivatives to solve various scientific and engineering problems, as demonstrated by a huge number of research publications on DE in the forms of monographs, edited volumes and archival articles. Consequently, DE related algorithms have frequently demonstrated superior performance in challenging tasks. It is worth noting that DE has always been one of the top performers in previous competitions held at the IEEE Congress on Evolutionary Computation. Nonetheless, the lack of systematic benchmarking of the DE related algorithms in different problem domains, the existence of many open problems in DE, and the emergence of new application areas call for an in-depth investigation of DE.

This special session aims at bringing together researchers and practitioners to review and re-analyze past achievements, to report and discuss latest advances, and to explore and propose future directions in this rapidly emerging research area.

Topics

- DE for continuous, discrete, mixed, single-objective, multi-objective, constrained, large-scale, multiple optima seeking, dynamic and uncertain optimization
- Review, comparison and analysis of DE in different problem domains
- Experimental design and empirical analysis of DE
- Study on initialization, reproduction and selection strategies in DE

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- Study on control parameters (e.g., scale factor, crossover rate, and population size) in DE
- Self-adaptive and tuning-free DE
- Parallel and distributed DE
- Theory of DE
- Synergy between DE and machine learning techniques
- Hybridization of DE with other optimization techniques
- Interactive DE
- Application of DE to real-world problems