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On the Performance of Differential Evolution Variants in Constrained Structural Optimization

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ABSTRACT

Constrained optimization is a highly important field of engineering as most real-world optimization problems are associated with one or several constraints. Such problems are often challenging to solve due to their complexity and high nonlinearity. Differential evolution (DE) is arguably one of the most versatile and stable population based search algorithm that exhibits robustness to multi-modal problems and has shown to be very efficient when solving constrained global optimization problems. In this paper we investigate the performance of several DE variants existing in the literature such as the traditional DE, the composite DE (CoDE) [1], the adaptive DE with optional external archive (JADE) [2] and the self-adaptive DE (jDE [3] and SaDE [4]), for handling constrained structural optimization problems. The performance of each DE variant is quantified by using four well-known benchmark structures in 2D and 3D. Various metrics are implemented, in an effort to create a fairly common assessment framework. It is shown that JADE, which updates control parameters in an adaptive way, truly exhibits superior performance and outperforms the other DE variants in all the cases examined.

References

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