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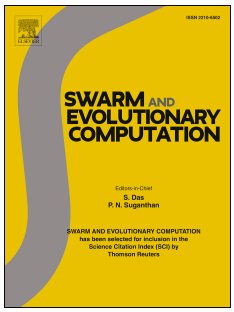

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A Historical Solutions based Evolution Operator for Decomposition-based Many-objective Optimization

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Abstract

As a kind of iterative algorithm based on population, an evolutionary algorithm generates many solutions at each generation. The historical solutions can provide information about the former generations and in turn help to guide the evolving of population. Thus, this paper utilizes the historical solutions and proposes a new evolution operator for decomposition-based many-objective optimization. The new operator combines the vertical information across different generations and the horizontal information from the current generation. Moreover, a two-stage bound-checking mechanism and an adaptive parameter setting scheme are designed to assist the proposed operator. After incorporating the proposed operator and some related techniques into the decomposition-based framework, we form a new algorithm called MOEA/D-HSE. The experimental results on well-known benchmark problems ranging from 5 to 15 objectives show that MOEA/D-HSE significantly outperforms other peer algorithms on the vast majority of the test instances, demonstrating the effectiveness and competitiveness of the proposed operator.

Keywords: Many-objective optimization, Evolutionary algorithm, MOEA/D, Reproduction operator, Historical solutions

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