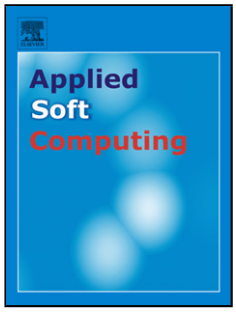

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Hybrid Adaptive Evolutionary Algorithm Based on Decomposition

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Abstract

The performance of search operators varies across the different stages of the search/optimisation process of Evolutionary Algorithms (EA). In general, a single search operator may not do well in all these stages when dealing with different optimization and search problems. To mitigate this, adaptive search operator schemes have been introduced. The idea is that when a search operator hits a difficult patch (under-performs) in the search space, the EA scheme "reacts" to that by potentially calling upon a different search operator. Hence, several multiple-search operator schemes have been proposed and employed within EA. In this paper, a Hybrid Adaptive Evolutionary Algorithm Based on Decomposition (HAEA/D) that employs four different crossover operators is suggested. Its performance has been evaluated on the well-known IEEE CEC'09 test instances. HAEA/D has generated promising results which compare well against several well-known algorithms including MOEA/D, on a number of metrics such as the Inverted Generational Distance (IGD), the hyper-volume, the Gamma and Delta functions. These results are included and discussed in this paper.

Keywords: Multi-Objective Optimization, Adaptive Operator Selection, MOEA, MOEA/D

1. Introduction

The performance of search operators varies across the different stages of the search/optimisation process of Evolutionary Algorithms (EA). In general, it is difficult for a single search operator to do well in all stages of EAs when dealing with various optimization and search problems. To mitigate this, adaptive search operator schemes have been introduced. The idea is that when a search operator hits a difficult patch (under-performs) in the search space, the EA scheme "reacts" to it by potentially calling upon a different search operator. Hence, several multiple-search operator schemes have been proposed and employed within EAs. Note that this approach is different from the Multiple Algorithms Single Formulation (MASF) approach advocated in [54]. In [54], algorithms which do not perform well may eventually die out completely when the resources allocated to them are exhausted and not replenished. Here, operators remain alive throughout the search process. Although the approach put forward here is innovative, it is not entirely