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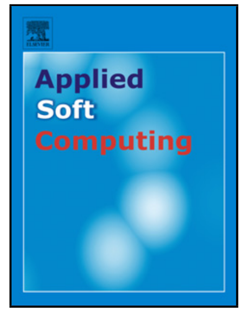

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A Kriging-Assisted Multiobjective Evolutionary Algorithm

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Graphical Abstract

Not available yet.

Highlights

- previous paper presented the GeDEA-II
- a great step forward is here presented which we called GeDEA-II-K
- it features a novel hybrid architecture supported by Kriging
- comparison is given among GeDEA-II-K and other modern on different extremely multidimensional test problems
- performance of GeDEA-II-K on test cases is shown

***Abstract*—A surrogate-assisted (SA) evolutionary algorithm for Multiobjective Optimization Problems (MOOPs) is presented as a contribution to Soft Computing (SC) in Artificial Intelligence (AI). Such algorithm is grounded on the cooperation between a "pure" evolutionary algorithm and a Kriging based algorithm featuring the Expected Hyper-Volume Improvement (EHVI) metric Comparison with state-of-art pure and Kriging-assisted algorithms over two- and three-objective test functions have demonstrated that the proposed algorithm can achieve high performance in the approximation of the Pareto-optimal front mitigating the drawbacks of its parent algorithms.**

***Keywords*—Soft-computing, Evolutionary computation, Multiobjective optimization, Surrogates, Metamodels, Kriging.**

I. Introduction

EVOLUTIONARY Algorithms (EAs) play an important role in the framework of artificial intelligence (AI) and, in particular in Soft-Computing (SC), when dealing with multi-objective problems in real-world engineering optimization [1],[2]. Research in this field is primarily concentrated toward reducing the computational effort for obtaining multiple optima. At the same time, quality and variety of optimal solutions is of fundamental importance to engineers in order to give them a number of choices among which to select the most appropriate ones with a high level of confidence. The latter can be referred to as "convergence ability".

Most of the times, computational effort and convergence ability are conflicting tasks: the lower the former, the lower the quality of the obtained solutions. Generally speaking, in non-deterministic algorithms found in metaheuristics, both the computational effort and convergence ability depend on the absolute number of direct function evaluations. While "exact" solutions can be obtained using a direct objective function evaluation only, generation of "non-exact" or approximate solutions can be obtained using a response surface (often referred to as a "metamodel" or "surrogate"), which mimics the real objective function landscape being computationally cheaper to evaluate [3].