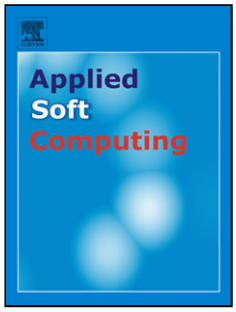

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PII: S1568-4946(18)30002-4
DOI: https://doi.org/10.1016/j.asoc.2017.12.046
Reference: ASOC 4643

To appear in: *Applied Soft Computing*

Received date: 1-7-2017
Revised date: 26-9-2017
Accepted date: 31-12-2017

Please cite this article as: { https://doi.org/

Hybrid Surrogate-based Optimization using Space Reduction (HSOSR) for Expensive Black-box Functions

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Highlights

- HSOSR presents a new space reduction technique based on kriging and RBF.
- HSOSR proposes a multi-start optimization approach to explore kriging and RBF, which improves the efficiency of sampling.
- Part of supplementary samples need to be filtered for the sampling diversity, and the global exploration ability gets enhanced.
- HSOSR utilizes the estimated mean square error of kriging to avoid getting stuck in a local valley.
- HSOSR makes a reasonable tradeoff between "exploitation" and "exploration" in the proposed optimization framework.
- HSOSR shows the wide applicability, high efficiency and strong robustness on benchmark cases.

Abstract—In this paper, a surrogate-based global optimization algorithm HSOSR is presented, which can solve expensive black-box optimization problems with box constraints. In order to decrease difficulty of the search in large-scale multimodal problems, a space reduction method based on hybrid surrogates is proposed. Kriging and Radial Basis Function (RBF) are employed to approximate the true expensive problems, respectively. A large number of samples are generated by Latin hypercube sampling to obtain the predictive values from the two surrogates. According to the size of these predictive values from kriging and RBF, all the samples are sorted, respectively. Subsequently, two potentially better regions from kriging and