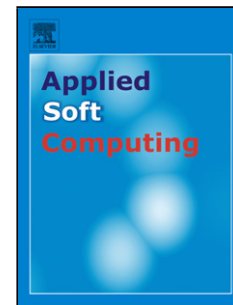


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SCGOSR: Surrogate-based Constrained Global Optimization using Space Reduction

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Highlights

- SCGOSR can effectively solve optimization problems with costly objective and constraints.
- A multi-start constrained optimization algorithm is presented to select promising solutions.
- A novel space reduction strategy is presented based on two different penalty functions.
- SCGOSR utilizes the estimated MSE of kriging to avoid getting trapped in a local valley.
- SCGOSR makes a reasonable tradeoff between “exploitation” and “exploration” in the proposed optimization framework.
- SCGOSR shows the wide applicability, high efficiency and strong stability on benchmark cases.

Abstract — Global optimization problems with computationally expensive objective and constraints are challenging. In this work, we present a new kriging-based constrained global optimization algorithm SCGOSR that can find global optima with fewer objective and constraint function evaluations. In SCGOSR, we propose a multi-start constrained optimization algorithm that can capture approximately local optimal points from kriging and select the promising ones for updating. In addition, according to two different penalty functions, two subspaces are created to construct local surrogate models and speed up the local search. *Subspace1* is the neighborhood of the presented best solution, and *Subspace2* is a region that covers several promising samples. The proposed multi-start constrained optimization is carried out alternately in *Subspace1*, *Subspace2* and the global space. With

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