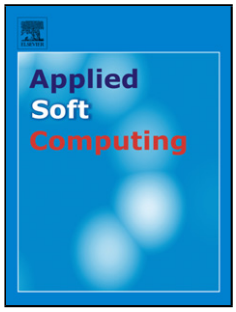

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PII: S1568-4946(17)30494-5
DOI: http://dx.doi.org/doi:10.1016/j.asoc.2017.08.012
Reference: ASOC 4402

To appear in: *Applied Soft Computing*

Received date: 9-5-2016
Revised date: 27-7-2017
Accepted date: 6-8-2017

Please cite this article as: Guohua Wu, Witold Pedrycz, P.N.Suganthan, Haifeng Li, Using Variable Reduction Strategy to Accelerate Evolutionary Optimization, Applied Soft Computing Journalhttp://dx.doi.org/10.1016/j.asoc.2017.08.012

Using Variable Reduction Strategy to Accelerate Evolutionary Optimization

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Graphical abstract

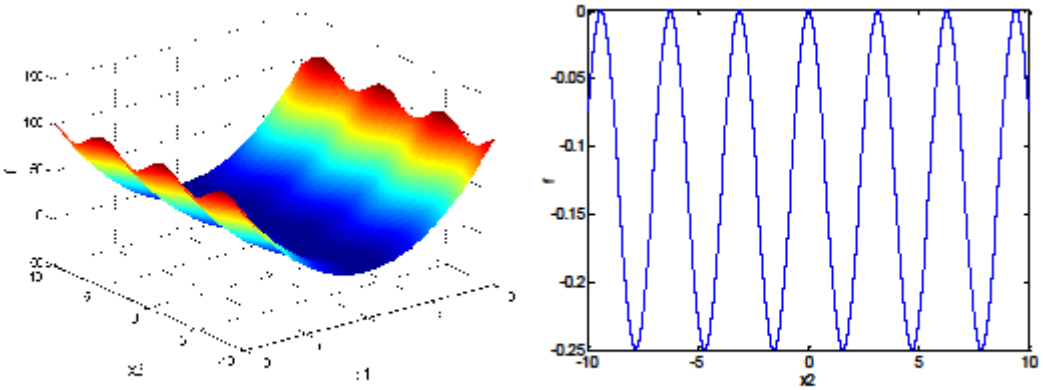

Fig.1 Solution space transformation due to variable reduction

Highlights

- A novel variable reduction strategy for (un)constrained optimization problems is proposed for accelerating the evolutionary optimization.
- The essence, application potential and challenges of the variable reduction strategy are discussed.
- The effectiveness of the variable reduction strategy is demonstrated by real-life and benchmark optimization problems.

Abstract: In this study, we introduce a novel approach of variable reduction and integrate it into evolutionary algorithms in order to reduce the complexity of optimization problems. We develop reduction processes of variable reduction for derivative unconstrained optimization problems (DUOPs) and constrained optimization problems (COPs) with equality constraints and active inequality constraints. Variable reduction uses the problem domain knowledge implied when investigating optimal conditions existing in optimization problems. For DUOPs, equations involving derivatives are considered while for COPs, we discuss equations expressing the equality constraints. From the relationships formed in this way, we obtain relationships among the