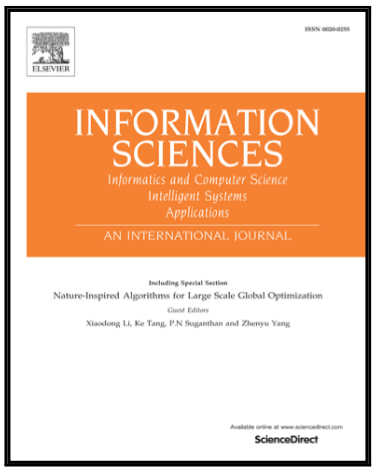

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A Hybrid Differential Evolution Algorithm for Mixed-Variable Optimization Problems

Ying Lin, Yu Liu, Wei-Neng Chen* and Jun Zhang

Abstract - Mixed-variable optimization problems (MVOPs) that involve continuous and discrete decision variables widely exist in industrial and scientific domain. However, how to solve MVOPs efficiently remains an open issue because the fact that continuous and discrete variables present different spatial distribution features posts a great challenge to algorithmic design. In this paper, a hybrid differential evolution (DE) framework is proposed for MVOPs. The proposed framework, namely DE_{MV}, hybridizes the original DE and the set-based DE for evolving continuous and discrete variables, respectively. The two DEs are selected for hybridization because algorithmic analysis and experimental studies show that they share the same search mechanism. The compatibility and consistency of the two DEs is the key for enabling DE_{MV} to coevolve different types of decision variables efficiently. Experiments are conducted on a set of artificial MVOPs converted from continuous benchmark functions and real-world engineering problems with mixed variables. Experimental results and comparisons with other representative algorithms show that DE_{MV} is effective and efficient.

Index Terms - Mixed-variable optimization (MVOP), differential evolution (DE), set theory