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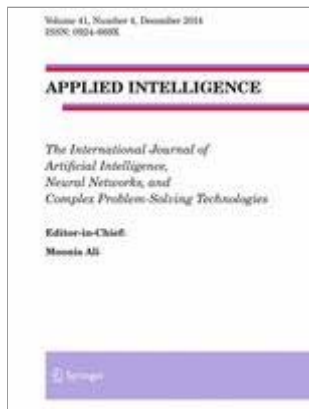# An improved Differential Evolution algorithm using learning automata and population topologies

Abstract

A new variant of Differential Evolution (DE), called ADE-Grid, is presented in this paper which adapts the mutation strategy, crossover rate (CR) and scale factor (F) during the run. In ADE-Grid, learning automata (LA), which are powerful decision making machines, are used to determine the proper value of the parameters CR and F, and the suitable strategy for the construction of a mutant vector for each individual, adaptively. The proposed automata based DE is able to maintain the diversity among the individuals and encourage them to move toward several promising areas of the search space as well as the best found position. Numerical experiments are conducted on a set of twenty four well-known benchmark functions and one real-world engineering problem. The performance comparison between ADE-Grid and other state-of-the-art DE variants indicates that ADE-Grid is a viable approach for optimization. The results also show that the proposed ADE-Grid improves the performance of DE in terms of both convergence speed and quality of final solution.

Volume 41, Number 4, December 2014
ISSN: 0924-669X

APPLIED INTELLIGENCE

The International Journal of
Artificial Intelligence,
Neural Networks, and
Complex Problem-Solving Technologies

Editor-in-Chief:
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Springer

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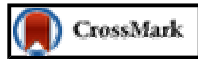
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