

Leveraged Neighborhood-Restructuring in Cultural Algorithms for Solving Real-World Numerical Optimization Problems

Authors: Mostafa Ali, Ponnuthurai Suganthan, Robert Reynolds, and Amer Al-Badarnah

Abstract: Many researchers have developed population-based techniques to solve numerical optimization problems. Almost none of these techniques demonstrate consistent performance over a wide range of problems as these problems differ substantially in their characteristics. In the state-of-the-art Cultural Algorithms, problem solving is facilitated by the exchange of knowledge between a network of active knowledge sources in the belief space and networks of individuals in the population space. To enhance the performance of Cultural Algorithms, we restructure the social fabric interconnections to facilitate flexible communication among problem solvers in the population space. Several social network reconfiguration mechanisms and types of communications are examined. This extended Cultural Algorithm is compared with other variants of Cultural Algorithms and other well-known state-of-the-art algorithms on a set of challenging real-world problems. The numerical results show that the injection of neighborhoods with flexible sub-networks enhances performance on a diverse landscape of numerical optimization problems.