

Effective local evolutionary searches distributed on an island model solving bi-objective optimization problems

Abstract

Using multiple local evolutionary searches, instead of single and overall search, has been an effective technique to solve multi-objective optimization problems (MOPs). With this technique, many parallel and distributed multi-objective evolutionary algorithms (dMOEAs) on different island models have been proposed to search for optimal solutions, efficiently and effectively. These algorithms often use local MOEAs on their islands in which each local search is considered to find a part of optimal solutions. The islands (and the local MOEAs), however, need to communicate to each other to preclude the possibility of converging to local optimal solutions. The existing dMOEAs rely on the central and iterative process of subdividing a large-scale population into multiple subpopulations; and it negatively affects the dMOEAs performance. In this paper, a new version of dMOEA with new local MOEAs and migration strategy is proposed. The respective objective space is first subdivided into the predefined number of polar-based regions assigned to the local MOEAs to be explored and exploited. In addition, the central and iterative process is eliminated using a new proposed migration strategy. The algorithms are tested on the standard bi-objective optimization test cases of ZDTs, and the result shows that these new dMOEAs outperform the existing distributed and parallel MOEAs in most cases.