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A Many-Objective Evolutionary Algorithm Based on A Projection-assisted Intra-family Election

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Abstract

In recent years, many researchers have put emphasis on the study of how to keep a good balance between convergence and diversity in many-objective optimization. This paper proposes a new many-objective evolutionary algorithm based on a *projection-assisted intra-family election*. In the proposed algorithm, *basic evolution directions* are adaptively generated according to the current population and potential *evolution directions* are excavated in each individual's *family*. Based on these *evolution directions*, a strategy of *intra-family election* is performed in every family and elite individuals are elected as representatives of the specific *family* to join the next stage, which can enhance the convergence of the algorithm. Moreover, a selection procedure based on angles is used to maintain the diversity. The performance of the proposed algorithm is verified and compared with several state-of-the-art many-objective evolutionary algorithms on a variety of well-known benchmark problems ranging from 5 to 20 objectives. Empirical results demonstrate that the proposed algorithm outperforms other peer algorithms in terms of both the diversity and the convergence of the final solutions set on most of the test instances. In particular, our proposed algorithm shows obvious superiority when handling the problems with larger number of

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