

## Fast Parallel Identification of Multi-peaks in Function Optimization \*

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### ABSTRACT

A class of hybrid niching evolutionary algorithms (HNE) using clustering crowding and parallel local search is proposed. By analyzing topology of fitness landscape and extending the space for searching similar individual, HNE determine the locality of search space more accurately, thus decreasing the replacement errors of crowding and suppressing genetic drift of the population. The integration of deterministic and probabilistic crowding increases the capacity of both parallel local hill-climbing and maintaining multiple subpopulations. Parallel local search based on simplex method over disjoint subpopulations greatly speed up the convergence of the population towards various optima simultaneously. Real coded representation and Gaussian mutation improve the precision of the solutions founded. The experimental results optimizing various multimodal functions show that, the performances of HNE such as the number of effective peaks generated and maintained, average peak ratio, global optimum ratio and CPU time consumed are uniformly superior to those of genetic algorithms using sharing, deterministic crowding method.

**Keywords:** Evolutionary Algorithms, Genetic Drift, Niche, Clustering Crowding, Parallel Local Search.

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