A New Parallel Distributed Genetic Algorithm Applied to Traveling Salesman Problems

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Abstract

This paper proposes a new method of genetic algorithms (GAs) for dicrete optimization problems. For continuous problems, it has been reported that parallel distributed genetic algorithms (PDGAs) show higher performance than conventional GAs. But, for discrete optimization problems, the performance of PDGAs has not been clearly shown. We examine the performance of conventional GAs, distributed GAs, and the proposed method for a typical optimization problem, the Traveling Salesman Problem(TSP). The features of the proposed method are based on multiple crossover operations applied to the entire population (Centralized Multiple Crossover: CMX) and the isolated DGA.

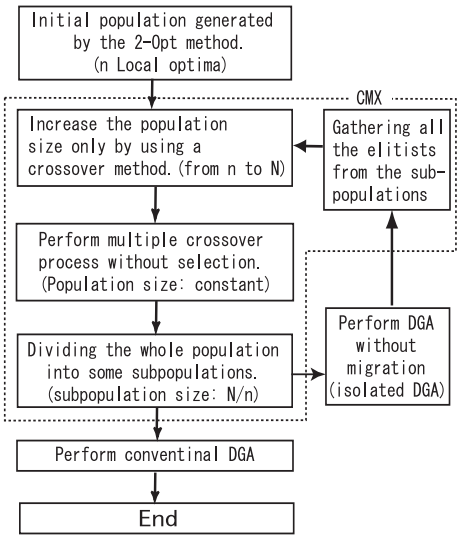

Figure 1: Flowchart of the proposed method.

1 PROPOSED METHOD

The fundamental concept of the proposed method is as follows. For problems with non-separable objective functions such as TSP, the global optimum can be obtained by appropriately combining their minimum elements of the local optima. The local optima is obtained by some heuristic search methods or a DGA without migration. On the other hand, The appropriate combination of the minimum elements of the solutions is performed by using multiple crossovers without selection.

2 EXPERIMENTS ON CMX

Figure 2 shows the effect of the number of repeated CMXs on the histories of the total distance. In this figure, CMX1, 2, and 5 represent one, two, and five times CMX processes, and it is recognized that increase in the number of the CMX processes yields higher performance. Several other experimental results also show the similar tendencies and the proposed method is found to be very effective for discrete optimization problems.

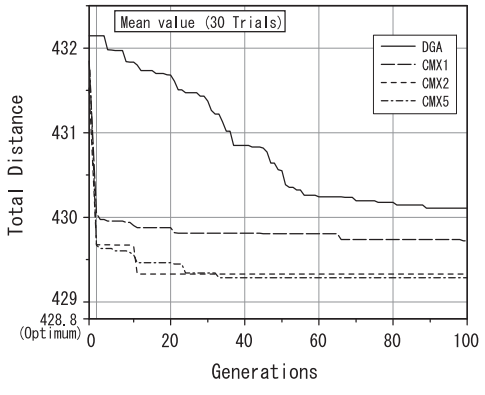

Figure 2: Effect of the repeated CMX processes.