# LCGA : Local Cultivation Genetic Algorithm for Multi-Objective Optimization Problems

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## Abstract

In this paper, a new genetic algorithm for multi-objective optimization problems is introduced. That is called "Local Cultivation GA (LCGA)". LCGA has a neighborhood crossover mechanism in addition to the mechanism of GAs that had proposed in the past researches. As compared with SPEA2, NSGA-II, and MOGA, LCGA is the robust algorithm which should find the Pareto optimum solution. Since LCGA is easy to implement to parallel computer as a master-slave model, the reduction of calculation cost can be expected.

## 1 Local Cultivation GA

We develop a new algorithm that is called Local Cultivation Genetic Algorithm (LCGA). LCGA has a neighborhood crossover mechanism in addition to the mechanisms of GAs that had proposed in the past researches. The following mechanisms are included in LCGA.

1) Preservation mechanism of the excellent solutions
2) Reflection mechanism of the preserved excellent solutions
3) Cut down (sharing) method of the preserved excellent solutions
4) Assignment method of fitness function
5) Normalization mechanism of values of each object

In LCGA, the exploitation factor of the crossover is reinforced. In the crossover operation of LCGA, a pair of the individuals for crossover is not chosen randomly, but individuals who are close each other are chosen. Because of this operation, child individuals that are generated after the crossover may be close to the parent individuals. Therefore, the precise exploitation is expected.

## 2 Numerical Examples

To discuss the effectiveness of the proposed method, LCGA was applied to test functions and results were compared to the other methods; those are SPEA2, NSGA-II and MOGA.

Figure 1 shows the derived Pareto solutions of KUR. These are the results of 10 trials. In this figure, LCGA derived better solutions than the other methods. Several other experimental results also show the similar tendencies. Through the numerical examples, the following points became clear.

- In all the test functions, LCGA derived better solutions than the other methods. From this result, it can be noted that the neighborhood crossover acts to derive the good solutions.
- On the other hand, the other methods can get good solutions in particular test function. Therefore, it can be concluded that LCGA is a robust method to find Pareto optimum solutions.

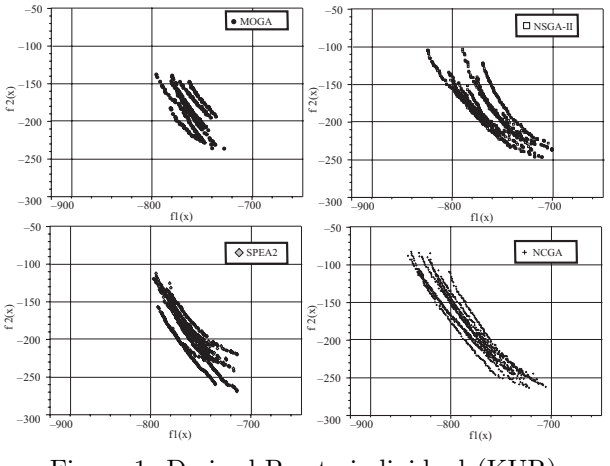


Figure 1: Derived Pareto individuals(KUR)