CHEPTER VII

CONCLUSIONS

Evolutionary algorithm (EA) can efficiently solve multi-objective optimization problem. Unfortunately, EA requires many parameters. Consequently, the selection of the parameters value is important, and has an effect on accuracy and convergence of the solution.

In this work, we studied the effect of genetic parameters (mutation and crossover probability) in evolutionary algorithm for multi-objective optimization problems. MOGA, NSGA, NPGA, NSGA-II and SPEA were investigated.

Without the mutation operator, non-elitist multi-objective evolutionary algorithms (MOGA, NSGA and NPGA) cannot obtain a good spread of Pareto-optimal solutions. But with too large mutation probability, these algorithms also show inability to find a good spread of the Pareto-optimal solutions obtained. The influence of the crossover operator was also analyzed. In the case that the value of crossover probability is too large, the population diversity rapidly decreases. Thus, the population converges to a limited range of the Pareto-optimal front. In comparison, with low crossover probability, the obtained Pareto-optimal solution is away from the actual Pareto-front.

In the case of elitist multi-objective evolutionary algorithms (NSGA-II, SPEA) without the mutation operator, both algorithms also fail to find a good spread of Pareto-optimal solutions. The mutation probability value has a small effect on both algorithms. The influence of the crossover operator was also analyzed. When the value of crossover probability is large, crossover operator can create offspring populations which are fairly different from the parent populations. When the value of crossover probability is too low, the obtained Pareto-optimal solution is away from the actual Pareto-front.

In the case of non-elitist Multi-objective Evolutionary algorithms, we concluded that the optimal value of mutation probability is between 0.04 and 0.1. While the suitable value of crossover probability is between 0.4 and 0.6. And in the case of elitist Multi-objective

Evolutionary algorithms, the optimal value of mutation probability is more than 0.04. While the suitable value of crossover probability is between 0.55 and 1.

In addition, the developed guideline for selection genetic parameters has been successful tested through several optimization problems. An applicability of our approaches has been illustrated in the case study: synthesis phenol recovery process problem.