ツアーガイド割当問題に注目した多目的最適化に対するアルゴリズムに関する研究

Form 3

Abstract

Title "A Study on Algorithms for Multi-objective Optimization Focusing on Tour Guide Assignment Problem"

Tour guide assignment has an important impact in a tourist service center. A well-arranged assignment could decrease the operational cost and increase the quality of service. We previously proposed and developed an optimum solution for Tour Guide Assignment Problem (TGAP) based on cellular Genetic Algorithm (cGA) in a single objective optimization. However, in a real-world problem, the processes usually involve multiple potentially conflicting interests regarding to the objectives. Considering TGAP as a multi-objective could describe the problem as close as the nature of the problem.

Multi-objective evolutionary algorithms (MOEA) are well known for solving single- and multi-objective optimization problems. In this dissertation, we conducted optimization of multi-objective Tour Guide Assignment Problem considering total guiding time, total assignment cost and service quality. Several known multi-objective evolutionary algorithms such as, NSGAII, SPEAII, Ɛ-MOEA, Ɛ-NSGAII, PAES, PESAII and NSGAIII have been used to solve and evaluate the problem in MOEA framework. In order to evaluate the quality of solutions, Hypervolume, Generational Distance and Maximum Pareto Front Error were being used as performance indicators to compute and statistically analyzed the results. We concluded that NSGAIII gave better performance than the other algorithms in term of solution quality and running time.

Furthermore, we applied ε-dominance concept to maintain the diversity of the pareto set which become the drawback in NSGAIII. Hypervolume, Generational Distance and Reference Point Convergence have been used to measure the results. We found that ε-NSGAIII has better performance compared to the original NSGAIII, ε-NSGAII and ε-MOEA on the problem.

In addition, an extended version of ε-NSGAIII named adaptive ε-NSGAIII has been proposed by introducing adaptive ε-parameter concept to improve the algorithm. For performance analysis, we used Hypervolume, Generational Distance, Reference Point Convergence and one additional performance indicator named Spread Measuring indicator. As the results, we found that introducing adaptive ε-parameter concept on ε-NSGAIII could increase the performance of the algorithm on solving Multi-objective TGAP. Finally, we tested the performance of proposed algorithm on other real-life problem named MOTSP. As the results, Adaptive ε-NSGAIII could also solve the problem with good performance.

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