Particle Swarm Optimization with Selective Regeneration Mechanism for Continuous Problems

Student：I-WEI KAO Advisor：Dr. Chi-Yang Tsai

Institute of Industrial Engineering and Management
Yuan-Ze University

ABSTRACT

In recent years, meta-heuristic algorithms have been applied to a variety of complex problems in order to obtain quality solutions within acceptable computation time. Particle swarm optimization (PSO) is an efficient meta-heuristic algorithms based on the movement and intelligence of swarms. There were many researchers who developed improved or hybridized PSO algorithms. Most of them attempted to improve solution quality, robustness or efficiency. This research proposes an improved particle swarm optimization with novel mechanism. In order to increase efficiency, suggestions on algorithm's parameter settings are proposed. In addition, "Selective Particle Regeneration" mechanism is designed to prevent the search from falling into local optima. To evaluate its effectiveness and efficiency, this approach is applied to multimodal function optimizing tasks and the performance is compared with PSO and other modified algorithms.

In the second part of this research, the application of the proposed algorithm is presented and discussed. First, SRPSO is applied to partition data clustering problems. The datasets with a variety of complexity are utilized for testing. In addition, SRPSO is combined with K-mean (KSRPSO) to increase the efficiency. Furthermore, SRPSO is employed to solve the inventory classification problem in a two-stage supply chain system. This algorithm automatically determines the optimal number of inventory groups and aim to minimize the total related costs in the supply chain. The total related cost, item classification and replenishment strategy in supply chain are compared and explained. After thorough tests and experiments on the above-mentioned continuous problems, the results fully demonstrate that SRPSO is a highly effective, efficient, and robust algorithm for continuous problems.

Keyword: Particle Swarm Optimization Cognition and Social Parameters Selective Particle Regeneration Mechanism Data Clustering Inventory Classification