

PARALLEL GENETIC ALGORITHM WITH ADAPTIVE GENETIC PARAMETERS TUNED BY FUZZY REASONING

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ABSTRACT. *Genetic algorithms (GAs) have several problems, the importance of which is that the search ability of ordinary GAs is not always optimal in the early and final stages of the search because of fixed GA parameters. Therefore, the fuzzy adaptive search method for genetic algorithms has been proposed, which is able to tune the genetic parameters according to the search stage by the fuzzy rule. In this paper, a fuzzy adaptive search method for parallel genetic algorithms is developed, in which the high-speed search ability of fuzzy adaptive tuning by FASGA is combined with the high-quality solution capacity of parallel genetic algorithms. The proposed method offers improved search performance, and produces high-quality solutions. Simulations are performed to confirm the efficiency of the theoretic results, which is shown to be superior to both ordinary and parallel genetic algorithms.*

Keywords: Parallel genetic algorithm, Migration, Fuzzy reasoning, Adaptive search

1. **Introduction.** Genetic algorithms (GAs) are search algorithms based on the mechanics of natural selection and natural genetics [1,2]. GAs can be applied to several types of optimization problems by encoding design variables to individuals. However, GAs also have several problems, the importance of which is that the search ability of ordinary GAs is not always optimal. This is particularly important in the early and final stages of the search, and is due to the GA parameters (crossover rate, mutation rate etc.) being fixed. The large number of iterations required to find a solution using GAs also limits their utility. Thus, many types of modified GAs have been proposed in an attempt to improve the performance of this potentially useful technique.

Lee et al. proposed a method of dynamic control of GA parameters based on fuzzy logic techniques [3]. In this method, the population sizes, and crossover and mutation rates are decided from average and maximum fitness values and differentials of the fitness value by fuzzy rules. In our laboratory, a fuzzy adaptive search method for genetic algorithms (FASGA) has been developed as a modified GA [4-6]. By this method, efficient searching