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Abstract

The UMDA algorithm is a type of Estimation of Distribution Algorithms. This algorithm has better performance compared to others such as genetic algorithm in terms of speed, memory consumption and accuracy of solutions. It can explore unknown parts of search space well. It uses a probability vector and individuals of the population are created through the sampling. Furthermore, EO algorithm is suitable for local search of near global best solution in search space, and it dose not stuck in local optimum. Hence, combining these two algorithms is able to create interaction between two fundamental concepts in evolutionary algorithms, exploration and exploitation, and achieve better results of this paper represent the performance of the proposed algorithm on two NP-hard problems, multi processor scheduling problem and graph bi-partitioning problem.

Keywords Univariate Marginal Distribution Algorithm – Extremal Optimization – Generalized Extremal Optimization – Estimation of Distribution Algorithm

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Univariate Marginal Distribution Algorithm in Combination with Extremal Optimization (EO, GEO)

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1 Introduction

During the ninetieth century, Genetic Algorithms (GAs) helped us solve many real combinatorial optimization problems. But the deceptive problem where performance of GAs is very poor has encouraged research on new optimization algorithms. To combat these dilemma some researches have recently suggested Estimation of Distribution Algorithms (EDAs) as a family of new algorithms [1, 2, 3]. Introduced by Muhlenbein and Paaβ, EDAs constitute an example of stochastic heuristics based on populations of individuals each of which encodes a possible solution of the optimization problem. These populations evolve in successive generations as the search progresses–organized in the same way as most evolutionary computation heuristics. This method has many advantages which can be illustrated by avoiding premature convergence and use of a compact and short representation.

In 1996, Muhlenbein and PaaB [1, 2] have proposed the Univariate Marginal Distributions Algorithm (UMDA), which approximates the simple genetic algorithm.

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