

## STUDY ON SOLUTION MODELS AND METHODS FOR RANDOM ASSIGNMENT PROBLEM

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**ABSTRACT.** *In this paper, for the random assignment problem, we propose the concept of risk critical value of random variable on the basis of the analysis on the mechanism of random decision, and establish risk critical value models based on individual efficiency and objective benefit. Further, for the characteristic of each model, we present the concrete implementation strategy and method for random assignment problem based on objective benefit and genetic algorithm (denoted by GA-RAP, for short), by combining numerical method of calculating probability and evolutionary computation theory; and we prove that GA-RAP under forced preserving strategy is globally convergent by using Markov chain theory. Finally, by combining with a concrete example, we point out the limitation and deficiency of the risk critical value model based on individual efficiency, and analyze the performance of GA-RAP. All the results indicate, GA-RAP not only has better operability and convergence, but has higher computation efficiency and practicability.*

**Keywords:** Random variable, Assignment problem, Random assignment problem, Risk critical value, Genetic algorithm, GA-RAP, Markov chain

**1. Introduction.** In manufacturing and management process, an assignment problem, first appeared in a 1952 paper and generally recognized to be the beginning of the development of the classical assignment problem, is a typical optimization problem in which our objective is to assign  $n$  jobs to  $n$  persons at a minimum (maximum) time (benefit). Now the most popular and widely used method for this problem is Hungarian algorithm [1] proposed by Kuhn in 1955, but it can't directly solve all kinds of assignment problems under different backgrounds, such as, how to assign tasks to the equal persons if the resources each person needs are limited; under the condition of all the tasks being finished smoothly, how to assign tasks to the equal persons so that the maximum of the costs of the assignments could be minimized, and so on. In practical problems, we often meet these problems similar to the mentioned above. Therefore, many authors proposed generalized assignment problem, bottleneck assignment problem and quadratic assignment problem [2,3] and a variety of others etc. from different angles. In reference [4], David W. Pentico has provided a reasonably comprehensive survey of the different variations on the assignment problem that has appeared in the literature over the past 50 years. Moreover, in the existing literatures, several researchers developed different methodologies for solving