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CAPACITATED FUZZY TWO-STAGE LOCATION-ALLOCATION PROBLEM

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Abstract. *This paper presents a new class of two-stage minimum risk location and allocation model based on credibility theory. We first discuss an approximation approach to the location-allocation problem as well as the convergence of the approach. Then, we design a hybrid algorithm, which integrates the approximation approach, neural network and simulated annealing, to solve the proposed location-allocation problem. Finally, we provide a numerical example to test the effectiveness of the hybrid algorithm.*
Keywords: Credibility theory, Two-stage fuzzy programming, Location-allocation problem, Minimum risk criteria, Approximation approach, Hybrid algorithm

1. **Introduction.** Location-allocation problem requires locating a set of facilities and simultaneously allocating to these facilities demands for service from a set of customers in order to optimize some performance. This problem occurs in many practical settings [2], where facilities provide a homogeneous service, and attracts many researchers' interests. In this respect, the interested readers may refer to [4, 5, 6, 9, 15, 19, 20, 21, 22, 26]. Among them, Cooper [4] proposed location-allocation problem; Lee, Green and Kim [9] presented multiple criteria models for the location-allocation problem, and Logendran and Terrell [20] considered the incapacitated location-allocation problem with stochastic demands. Moreover, Gen and Cheng [5] discussed obstacle location-allocation problem, and Liu and Zhou [26] proposed the expected value model, chance-constrained programming and dependent-chance programming for capacitated location-allocation problem with stochastic demands. In addition, to solve the location-allocation problems, numerous methodologies have been proposed in the literature, e.g., Lozano, and Guerrero *et al.* [22] discussed the application of Kohonen maps to solve a class of location-allocation problems, Love [21] considered one-dimensional facility location-allocation problem using dynamic programming, Liu, Kao and Wang [15] solved location-allocation problems with rectilinear distances by simulated annealing, and Gong, Gen, Xu and Yamazaki [6] designed a hybrid evolutionary method for solving obstacle location-allocation problem. The reader who is interested in other optimization approaches, such as particle swarm optimization (PSO), may refer to [1, 7].

Since the concept of possibility measure was introduced by Zadeh [25] in his efforts to measure a fuzzy event, possibility theory has been studied by a number of researchers, such as Dubois and Prade [3], Klir [8], and Pedrycz [24]. Based on possibility theory,