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FUZZY PROGRAMMING THEORY BASED ON SYNTHESIZING EFFECT AND ITS APPLICATION

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Abstract. *In this paper, by analyzing the essential characteristic of fuzzy programming and the deficiencies of the existing methods, we propose the concept of synthesizing effect function for processing the objective function and constraints, and give an axiomatic system for synthesizing effect function. Then, we establish a general fuzzy programming solution model based on synthesizing effect function (denoted by BSE-FGM, for short), and give the concrete application demonstration. Finally, we analyze the model through an example. All the results indicate that our method not only includes the existing fuzzy programming methods, has better structural feature, but also can effectively merge the decision preferences into the solution, so it can be widely used in many fields such as complicated system optimization and artificial intelligence.*

Keywords: Fuzzy programming, Fuzzy decision, Fuzzy information, Synthesizing effect function, Inequity degree, Genetic algorithm

1. **Introduction.** Fuzziness is a widespread phenomenon in the real world and is unavoidable in many practical fields. In 1965, Zadeh [1] proposed the concept of fuzzy sets and established fuzzy set theory, which formed the foundation for describing and processing uncertain information. After that, a lot of progress has been made in both theory and application. And fuzzy programming has been a hot problem in research circle and application, many scholars have already given useful discussions. For example: [2] researched the fuzzy decision support system; [3] gave a solution for multi-objective fuzzy programming problem by normalizing and synthesizing all different objectives through some criterion function; [4] gave a solution for single objective fuzzy programming problem by introducing a function so that crisp the fuzzy constraints; In [5], the authors gave the telescopic indices of objective function and constraints, by converting the objective function into a piecewise function, then they gave a solution for fuzzy programming problem with fuzzy objective function and fuzzy restraints; [6] gave a solution for single objective fuzzy programming problem by combining fuzzied objective function and fuzzy operation; [7,8] discussed the solution for multi-objective fuzzy programming problem through the maximum satisfaction principle; [9] researched the solution of numerical fuzzy programming by using the structural characteristic of fuzzy information. With the development of computer science and evolutionary computation theory, evolutionary