

FUZZY LINEAR PROGRAMMING BASED ON INTERVAL-VALUED FUZZY SETS

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ABSTRACT. *In this paper we focus on fuzzy linear programming problems. The fuzzy linear programming problems will contain fuzzy constraint together with a fuzzy objective function. We use the interval-valued fuzzy sets and the method in Zimmermann [13], to derive a new method to solve the linear programming in the fuzzy sense from the crisp linear programming.*

Keywords: Fuzzy linear programming, Fuzzy constraint, Interval-valued fuzzy set, Fuzzy sense

1. **Introduction.** In articles [1, 6, 8, 9, 12], the authors discussed fuzzy linear programming problems. In these papers, the authors did not use the interval-valued fuzzy sets but only used general fuzzy sets to treat the problems. In this paper, we use the interval-valued fuzzy sets to treat problems of this sort. In Section 2, we consider the crisp linear program first. Let the objective function be $Z = \sum_{j=1}^n c_j x_j$. The constraints are $\sum_{j=1}^n a_{kj} x_j \leq b_k$, $k = 1, 2, \dots, m$, $x_j \geq 0$, $j = 1, 2, \dots, n$. Suppose that the optimal solution occurs at $x_j = x_j^{(0)}$, $j = 1, 2, \dots, n$. where $Z_0 = \sum_{j=1}^n c_j x_j^{(0)}$ is the maximum. If in a period T , the value of c_j , a_{kj} , b_k , $k = 1, 2, \dots, m$, $j = 1, 2, \dots, n$ does not change, then we have the optimal solution $Z_0 = \sum_{j=1}^n c_j x_j^{(0)}$ this is attained at $x_j = x_j^{(0)}$.

Linear programming models are a special kind of decision models; The decision space is defined by constraints and objective function. The classical Linear programming problem assumes that objective and constraint are "crisp". The term "to maximize" or "to minimize" applies to the crisp case in its strictest sense. In many practical situations, however, the exact values of the constraint coefficients are either vague or ambiguous due to imprecise information or unknown resources limits. Thus, the constraint coefficients of the original problem will be replaced with fuzzy numbers that produce the fuzzy constraints linear programming problem to be solved. This make it desirable to solve such linear programming problems in a fuzzy environment. The decision maker may not want to actually maximize or minimize the objective function. Assume that the decision maker can establish an aspiration level Z for the value of the objective function he wants to achieve and that each constraint can be modeled as a fuzzy set.

The first method for solving fuzzy linear programming problems was proposed by Zimmermann [13]. Dubois and Prade [6] studied linear fuzzy constraints. Tanaka and Asai [11] proposed a formulation of fuzzy linear programming with fuzzy constraints and gave