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A ROBUST MULTI-CRITERIA FUZZY PROGRAMMING PROBLEM CONSIDERING POSSIBILITY MEASURE

Takashi Hasuike and Hiroaki Ishii

Graduate School of Information Science and Technology
Osaka University
2-1 Yamadaoka, Suita, Osaka, 565-0871, Japan
thasuike@ist.osaka-u.ac.jp; ishii@ist.osaka-u.ac.jp

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Abstract. *This paper considers a multi-criteria mathematical decision model including fuzzy variables. As the proposed model is not well-defined due to fuzzy variables, thus to solve them directly and analytically, the possibility measure is introduced. Then, in order to aggregate the multi-criteria objective functions into the single-criterion, the fuzzy compromise programming model is proposed. Furthermore, by introducing the interval of each weight to the objective functions, the proposed model is reformulated as a robust programming problem. Since this problem is a semi-infinite programming problem, the an efficient algorithm is developed using the linearity of the proposed model. Finally, a numerical example is provided to compare proposed models with the basic model.*
Keywords: Multi-criteria programming, Possibility programming, Robust programming, Semi-infinite programming

1. **Introduction.** In the classical mathematical programming, coefficients of objectives or constraints in general problems are assumed to be completely known. However, in practical systems, these parameters are often not known exactly because they are variable, unreliable or imprecise in some way, and so they are rather uncertain than certain. In order to deal with such uncertainty, stochastic programming [1, 18] and fuzzy programming have been developed. They are useful tools for the decision making under a stochastic environment or a fuzzy environment, respectively. Particularly, the fuzzy mathematical programming has been developed for treating uncertainty in the setting of optimization problems. There have been studies in the past from both theoretical and computational points of view (see for example, [2, 4, 6, 11, 12, 13, 15, 16, 20] and the references therein). In fuzzy programming problems, the objective function is fuzzy-valued and there is no universal concept of optimal solutions to be widely accepted. Therefore, it is important to define some concepts for the fuzzy objective functions and constraints, and investigate their properties. In this regard, many approaches have been presented, such as parametric linear programming problems in order to obtain a reasonable optimal solution [17], possibility and necessity programming problems [5, 7], interactive programming problems [8, 16], etc.

Furthermore, some researchers have studied fuzzy programming problems based on semi-infinite programming techniques [3,14]. Most recently, Leon and Vercher [10] considered a fuzzy linear programming problem by using semi-infinite programming techniques to the aggregation of positive linear combinations for L-R fuzzy numbers of different shapes. Then, Vercher [19] proposed a portfolio selection model based on semi-infinite programming problem in a soft framework by extending the study [10]. These works