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A linear fractional bilevel programming problem with multi-choice parameters

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Abstract. A bilevel programming problem (BLPP) is a hierarchical optimization problem where the constraint region of the upper level is implicitly determined by the lower level optimization problem. In this paper, a bilevel programming problem is considered in which the objective functions are linear fractional and the feasible region is a convex polyhedron. Linear fractional objectives in BLPP are useful in production planning, financial planning, corporate planning and so forth. Here, the cost coefficient of the objective functions are multi-choice parameters. The multi-choice parameters are replaced using interpolating polynomials. Then, fuzzy programming is used to find a compromise solution of the transformed BLPP. An algorithm is developed to find a compromise solution of BLPP. The method is illustrated with the help of an example.

Keywords: bilevel programming, linear fractional programming problem, fuzzy programming, compromise solution, multi-choice parameters

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1. Introduction

The bilevel programming structure is a class of hierarchical problem that shows a two stage decision making process when the constrained region of the first level problem is implicitly determined by another optimization problem [3].
BLPP has been used by researchers in several fields ranging from economics to transportation engineering. BLPP is also used to model problems involving multiple decision makers. These include traffic signal optimization [17], structural design [19] and genetic algorithms [8].
Most of the extreme point algorithms are applied to the solution of a linear BLPP. Every linear bilevel programming problem with a finite optimal solution shares an important property where the optimal solution is attained at an extreme point

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