

Fuzzy Modeling and Solving Linear Programming Problems with Fuzzy Supply

Seyed Hadi Nasser^{*1,2}

* Ph.D. Student

¹ Department of Mathematical Sciences, Sharif University of Technology, Tehran, Iran.

² Department of Industrial Engineering and Management, Tokyo Institute of Technology, Tokyo, Japan.

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The classical linear programming (LP) problem is to find the minimum (or maximum) values of a linear function under constraints represented by linear inequalities or equations. In many practical situations, it is not reasonable to require that the constraints of the right-hand-side in LP problem be specified in precise, crisp terms. In such situations, it is desirable to use some type of fuzzy linear programming (FLP). Here, we explain FLP problems in which the right-hand-sides are fuzzy numbers. The FLP problems are first converted into equivalent crisp linear or nonlinear problems, which are then solved by standard methods. The final results of a FLP problem are thus real numbers, which represent a compromise in terms of the fuzzy numbers involved. Next, we determine the fuzzy set of optimal values by use of the optimal solution of two crisp LP problems. This is done by calculating the lower and upper bounds of the optimal values first. Finally, the problem becomes a max-min optimization problem. The current problem is actually a problem of finding a point which satisfies the constraints and goal with maximum degree. Now, we illustrate how fuzzy modeling is useful for solving linear programming problems with fuzzy supply. Hence, assume that a company produces two products. Product p_1 has a \$ 0.4 per unit profit and product p_2 has a \$ 0.3 per unit profit. Each unit of product p_1 requires twice as many labor hours as each product p_2 . The total available labor hours are at least 500 hours per day, and may possibly be extended to 600 hours per day, due to special arrangements for overtime work. The supply of material is at least sufficient for 400 units of both products, p_1 and p_2 per day, but may possibly be extended to 500 units per day according to previous experience. The problem is how many units of products p_1 and p_2 should be made per day to maximize the total profit? Now the above problem may be formulated as a linear programming problem with fuzzy supply and then by use of the above method for solving these linear programming problems with fuzzy resources, the optimal solution is $x_1^*=100$, $x_2^*=350$ and the maximum profit is $z^*=0.4x_1^*+0.3x_2^*=145$.

Since many industrial and management systems in the real world are too related to solve a LP problem, hence using fuzzy modeling is very efficient.

Suggestions: Most industrial and management systems in Iran and world can be used the fuzzy modeling for a desirable decision making.