A Simplified Novel Technique for Solving Fully Fuzzy Linear Programming Problems

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* In this paper, A modified version of the well-known simplex method is used for solving fuzzy linear programming problems. The use of a ranking function together with the Gaussian elimination process helps in solving linear programming problems in a fully uncertain environment.
* The problem is solved without converting it to its crisp equivalent.

# Basic definitions

1. Triangular fuzzy number

A triangular fuzzy number is represented by a triplet T = (u, v, w) and is defined as where u<v<w.

arithmetic operations on the triangular numbers are as given below:

1. T = (u, v, w), −T = (−w, −v, −u).
2. Addition T1 + T2 = (u1, v1, w1) + (u2, v2, w2) = (u1 + u2, v1 + v2, w1 + w2).
3. Subtraction T1−T2 = (u1, v1, w1) + (−w2, −v2, −u2) = (u1 − w2, v1 − v2, w1 − u2).
4. Ranking function

A ranking function is a mapping from a fuzzy set to the set of real numbers Rn. Let T = (u, v, w) then define the ranks on Rn

R(T) = u + w – σ

where, σ = is the variance between u and w.

# FLP Problem Formulation and Proposed Method

Consider FLP problems with 𝑚 fuzzy equality constraints and 𝑛 fuzzy variables may be formulated as follows:

max (or min) ⊗ 𝑥̃

such that,

⊗ 𝑥̃ <=

Where 𝑥̃ is non negative fuzzy number.

**Step 1**

Create initial table of revised simplex method

|  |  |  |  |
| --- | --- | --- | --- |
|  | [𝑥̃j]1xn | [𝑥̃s]1xn+m |  |
| [𝑥̃s] n+1 | [I j]m x n | n+1xn+m | [j]mx1 |
|  | ]1Xn | [0]1xn+m |  |

Here 𝑥̃s denotes the vector of slack variables. The identity matrix consists of the columns of the augmented matrix corresponding to the slack variables.

**Step 2**

For maximization problems, find the value of c˜j with the most negative ranking value. Let it be k .