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Research Paper

A Study on Some Contribution in Linear Programming Problem

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Abstract:

In this paper, another strategy is proposed for tackling completely fluffy straight programming (FFLP) issue, in which every one of the coefficients and choice factors are three-sided fluffy number and every one of the imperatives are fluffy uniformity or imbalance. With the assistance of closeness measure and positioning capacity, FFLP issue is changed into fresh nonlinear programming issue. Eventually, the proposed technique is delineated by mathematical model.

Keywords: Similarity measure, Ranking function, optimal solution.

1. Introduction

LP is a broadly applied enhancement procedure in day today life in view of its adequacy. In ordinary LP issue it is expected that leader (DM) makes certain with regards to the exact upsides of the choice boundaries. Notwithstanding, the noticed upsides of the information, all things considered, issues are regularly indistinct. Fluffy sets hypothesis has been applied to handle loose information in LP.

Lotfi et al. [1] have tackled FFLP issue by approximated the fluffy boundaries to the closest symmetric three-sided fluffy numbers and track down the fluffy ideal surmised arrangement. Amit et al. [2] have utilized the positioning capacity technique to change fluffy objective capacity into fresh one and get the fluffy ideal arrangement of FFLP issue. Khan et al. [3] have given an adjusted adaptation of simplex strategy for FFLP issue. Ezzati et al. [5] have presented another lexicographical requesting of three-sided fluffy numbers and change the FFLP issue into fresh multi-objective direct programming issue and track down the specific ideal arrangement of FFLP issue. As of late, Kaur and Kumar [4] have applied Mehar's technique on FFLP issue in which boundaries are L-R fluffy number. The paper is coordinated as follows. Some fundamental meanings of fluffy set hypothesis are introduced in Section 2. In Section 3, FFLP issue is introduced and another technique for taking care of FFLP issue is talked about. Segment 4 presents a mathematical representation lastly the paper finishes up in Section 5.

2. Preliminaries

In this part, some essential definitions and number-crunching tasks identified with three-sided fluffy numbers, which will be utilized in the remainder of the paper, are given.

Definition 2.1[2]. A fluffy number = (a1, a2, a3) is supposed to be a three-sided fluffy number if its participation work is given by A □

$$\mu_\lambda(x) = \begin{cases} \frac{x-a_1}{a_2-a_1}, & a_1 \leq x \leq a_2 \\ \frac{a_3-x}{a_3-a_2}, & a_2 \leq x \leq a_3 \\ 0, & \text{othenwise} \end{cases}$$

Let TF (R) denotes the set of all triangular fuzzz numbers.

Definition 2. 2[2]. Let $\tilde{A} = (a_l, a_2, a_3)$ and $\tilde{B} = (b_l, b_2, b_3)$ be two triangular fuzzy numbers then

1 $\tilde{A} \preceq \tilde{B}$ iff $\Re(\tilde{A}) \leq \Re(\tilde{B})$.

2 $\tilde{A} \succeq \tilde{B}$ iff $\Re(\tilde{A}) \geq \Re(\tilde{B})$.

3 $\tilde{A} \cong \tilde{B}$ iff $r(\tilde{A}) = \Re(\tilde{B})$

Definition 2. 3 [6]. Let $\tilde{A} = (a_1, a_2, a_3)$ and $\tilde{B} = (b_1, b_2, b_3)$ be two triangular fuzzy numbers then the similarity between two fuzzy numbers is defined as

$$d(\tilde{A}, \tilde{B}) = \sqrt{\frac{1}{3}[(a_1 - b_1)^2 + (a_2 - b_2)^2 + (a_3 - b_3)^2]}$$

Definition 2. 4[2]. The arithmetic operations on two triangular fuzzy numbers $A = (a_1, a_2, a_3)$ and $\tilde{B} = (b_1, b_2, b_3)$ are given by.

1 $\bar{A} \oplus \bar{B} = (a, a_2, a_3) \oplus (b, b_2, b_3) = (a_1 + b_1, a_1 + b_2, a_3 + b_3)$

2 $-\tilde{A} = -(a_1, a_2, a_3) = (-a_3, -a_2, -a_1)$

3 $\tilde{A} \theta \tilde{B} = (a_1, a_2, a_3) \theta (b_1, b_2, b_3) = (a_1 - b_3, a_2 - b_2, a_3 - b_1)$

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4 Let $\tilde{A} = (a_1, a_2, a_3)$ be any triangular fuzzy number and $\tilde{X} = (x_1, x_2, x_3)$ be a non-negative triangular fuzzy mumbers then

$$\lambda \otimes \tilde{X} \cong \begin{cases} (a_1x_1, a_2x_2, a_3x_3), & \mathrm{a}_1 \geq 0, \\ (a_1x_3, a_2x_2, a_3x_3), & \mathrm{a}_1 < 0, \mathrm{a}_3 \geq 0, \\ (a_1x_3, a_2x_2, a_3x_1), & \mathrm{a}_3 < 0. \end{cases}$$

$$5)\ \lambda\hat{A} = \begin{cases} (\lambda a_1, \lambda a_2, \lambda a_3), & \lambda \geq 0, \\ (\lambda a_3, \lambda a_2, \lambda a_1), & \lambda < 0. \end{cases}$$

3 Fully Fuzzy Linear Programming Problem

The FFLP problem is written as:

(P1) Max $Z(\tilde{X}) = \sum_{j=1}^{n} \tilde{c}_j \otimes \tilde{x}_j$

Subject to $\sum_{j=1}^{n} \tilde{a}_{ij} \otimes \tilde{x}_j (\leq, ?, \geq) \tilde{b}_i$ $i = 1,2 \ldots \ldots, m$ $\tilde{x}$, is non-negative trixngular fuzzy, $j = 1,2 \ldots., n$, where $\tilde{X} = [\tilde{x}_j]_{nd1}$, c_j, $a_g, \tilde{b}_i, \tilde{x}, \in$ TF $(R), j = 1,2 \ldots$ n $p = 1,2 \ldots, k_t$ and $i = 1,2 \ldots, m$

3.1 Proposed Method

In this segment, another calculation to observe a fluffy ideal arrangement of FFLP issue is proposed. The means of the proposed calculation are as per the following:

Stage 1: Using definition 2.4, the furzy requirements of the FFL.P issue can be changed over into the fresh limitations. The got bubbly straight programming issue can be composed as:

(P2) Max $\mathrm{Z}(\tilde{X}) = \sum_{j=1}^{n} \tilde{c}, \otimes \tilde{x}_j$

Subject to $x\left(\sum_{j=1}^{A} a_y \otimes x_j\right)(\leq, ?, \geq)\Re(\tilde{b})i = 1,2 \ldots, m_r$

$$x_j, y_j - x_j, z_j - y_j \geq 0\ j = 1,2 \ldots \ldots \mathrm{n}$$

Stage 2: as to Definition 2.5, the issue in sync 1 is changed over into the accompanying fresh multi-objective nonlinear programming issue.

(P3) Max $d\left(Z_q(\tilde{X}), \tilde{0}\right)$

Subject to $\Re\left(\sum_{j=1}^{n} \tilde{a}_y \otimes \tilde{x}_j\right)(\leq, ?, \geq)\Re\left(\tilde{b}_l\right)i = 1,2 \ldots, m, x_j, y_j - x_j, z_j - y_j \geq 0\ j = 1,2 \ldots \ldots$

Stage 3 Solve the fresh non-straight programing issue, acquired in Step 2 , to track down the ideal arrangement of x_j,y_j

4. Mathematical Example

In this segment proposed calculation is outlined with the assistance of mathematical model.

Erample 4.1 Max $Z_1(\tilde{X}) - (5,7,9)\tilde{x}_1 + (4,5,6)\tilde{x}_2 + (1,2,3)\tilde{x}_3$

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Subject

$\tilde{x}_1, \tilde{x}_2, \tilde{x}_3$ are non-negative triangular fuzzy mumbers.

From step 1 and step 2, (1) can be written as

$$\text{Moz}_1\ (\bar{x}) = \sqrt{\frac{1}{3}((5x_1 + 4x_1 + x_2)^2 + (7y_1 + 5y_2 + 2y_1)^2 + (9z_1 + 6z_2 + 3z_3)^2)}$$

Subject to $2x_1 + 2x_2 + x_3 + 10y_1 + 6y_2 + 4y_3 + 7z_1 + 4z_2 + 3z_3 = 64$

$$x_1 + x_2 + x_3 + 4y_1 + 4y_2 + 6y_3 + 3z_1 + 3z_2 + 3z_3 \leq 63$$
$$2x_1 + x_2 + 2x_3 + 6y_1 + 4y_2 + 6y_3 + 4z_1 + 4z_2 + 4z_3 \geq 73$$
$$x_j, y_j - x_j, z_j - y_j \geq 0\ j = 1,2,3$$

(2)

Now solving the problem (2) by LINGO 14.0, we get the optimal solution and optionl value of objective functions of groblem (1) are given in the table 1

Table 1

$\tilde{x}_1^*$	$\tilde{x}_2^*$	$\tilde{x}_3^*$	$Z(\tilde{X}^*)$
(0,0,0)	(0,0,9.75)	(1.25,1.25,6.25)	(1.25,2.5,77.25)

Conclusions

in this paper, another methodology for taking care of the FFLP issue s proposed. In this strategy, positioning capacity is applied on the fluffy limitations to change over it into crisps imperatives and similitude measure on true capacities.

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