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Neutrosophic Fuzzy Transportation Problem for finding optimal solution Using Nanogonal Number

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ABSTRACT

We have implimented a new number called Nanogonal Number for a [2] Neutrosophic Fuzzy Transportation Problem (NFTP) and changed VAM method to deliver the minimum cost value for transportation of particular items while the supply and demand are pointed as Nanogonal number. We also articulated a new method (Measures of Central Tendency Method) which adapt the [6] Nanogonal Number (NN) into a Crisp Number. For a precise understanding, a numerical illustration is also exhibited.

Keywords: Neutrosophic Fuzzy Set, Transportation Problems, Neutrosophic Fuzzy Transportation Problem, Nanogonal Number.

Introduction

[1] Lotfi Zadeh introduced fuzzy set which he expressed the goal of the author to point out the typical sign of a set and a proposition to put up Fuzziness in the point that it is in human language,(i.e) in human traditions, evaluation, and decisions making. [11] Ỉntuitionistic Fuzzy Sets (ỈFSs) initiated by Atanassov who has tinted these ideas and delivered a tool. The system incorporates both membership function "μ" and non-membership function "ν" with hesitation range "π" such that $\mu + \nu \leq 1$ and $\mu + \nu + \pi = 1$. He fixed on Ỉntuitionistic Fuzzy Sets Next Type (ỈFSNT) with the condition that the sum of the square of the membership and non-membership grade is less than or equal to 1. Pythagorean Fuzzy Set (PFS) is focused in a new source to deal with uncertainty considering the membership sign "μ" and non-membership sign "ν" satisfying the conditions ($\mu + \nu \leq 1$) or ($\mu + \nu \geq 1$), and also, it continues that ($\mu 2 + \nu 2 + \pi 2$) = 1, where "π" is the Pythagorean fuzzy set index. Score Function for the ranking level of Interval Valued Pythagorean Fuzzy Sets (IVPFSs) [4] pointed out by Garg which idea next level of IFS. Neutrosophic Set (NS) aimed by Smarandache which has the concept of which plays the inherent struggles that the output in Fuzzy Sets (FS) and Ỉntuitionistic Fuzzy Sets (ỈFS) and [5]Ƥythagorean Fuzzy Sets (ƤFS). We also focused the triplet components in this order: (tm, idf, fnm). "Single Valued Neutrosophic Set" is commonly called Neutrosophic "Fuzzy" Set by the Neutrosophic community. "A new technique method to solve [10] Fully Fuzzy Transportation Problem is using least allocation method", have expressed by [6] D. Santhosh Kumar and G.Charles Rabinson. "A method for solving a Pentagonal Transportation Problem via ranking technique and ATM", have exhibited by [7] G.Charles Rabinson and R.Chandrasekaran. "Socratic Technique to solve the Bulk Hexadecagonal Fuzzy Transportation Problem using ranking method" has derived b y[12] K.Nandhini and G. Charles Rabinson This research presents easier and alternative solution techniques for the NSFTP, the applications of which are very easy as compared to the already existing methods.

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Ƒuzzy Set: (FS)

[1] Ƒuzzy set Ά in ℛeal is given to be a set {(x , ($\mu_{Ά}$ (x)) |x∈ R }, $\mu_{Ά}$(x): X tends to [0,1] is mapping called the degree of membership function of the fuzzy set Ά and $\mu_{Ά}$(x) is called the membership value of x∈ X in the fuzzy set Ά . These membership values are represented by real numbers lying in [0, 1].

Ṡingle Valued Neutrosophic Set :(ṆS)

[2] A Single Valued Neutrosophic Set (SVNS) A in X is characterized by a Truth Membership Function $T_A(x)$ an Indeterminacy Membership Function $I_A(x)$ and a Falsity Membership Function F_A (x) and is expressed by AN = {[x, $T_A(x)$ $I_A(x)$ F_A (x) / x∈ X]}. Here $T_A(x)$), $I_A(x)$ and F_A (x) are real subsets of [0, 1] that is $T_A(x)$: X →[0,1] , $I_A(x)$: X →[0,1] and F_A (x): X → [0,1] . i.e) $0 \leq \sup [T_A(x)] + \sup [I_A(x)] + \sup [F_A(x)] \leq 3$.

Nanogonal Fuzzy Number: (NFN)

[6] Nanogonal Fuzzy Number (NFN) is created which can be effectively focused in finding a lot of decision making problems. A fuzzy number $\mathcal{N}$ in Ṛ is said to be Nanogonal Fuzzy Number if its membership function μ_N : Ṛ → [0,1] has the following characteristics.
Ṇ = {x_1,x_2, x_3,x_4, x_5,x_6, x_7,x_8, x_9}

Proposed Algorithm:

Step 1: Develop the Neutrosophic Fuzzy Nanogonal Transportation System and then Check whether the total availability and the total requirement are same or not. If both are balanced move to step 2 otherwise we have to modify Unbalanced TP to Balanced TP.
Step 2: Convert NFNTP to Crisp Number with the help of Measure of Central Tendency Formula (MCTF).
Step 3: Arrange the given numbers into Ascending Order then applying MCTF.
Step 4: Check all requirements (b_j) should be less than availabilities (a_i). If any one of the b_j is greater than a_i the corresponding cell has 0 values. Do the same process until the contraction will receive.
Step 5: Choose least value and next least value find the difference between the values. Do the same technique for all rows and columns.
Step 6: Select the largest penalty and choose the respective row or column then select the least cell and allocate the least value for that cell.
Step 7: Do the same technique until we will get the single cell.

Numerical Example:

Consider a Fuzzy Transportation Problem whose Cost, Availability and Requirement datas are in the form of Nanogonal Fuzzy Number. Neutrosophic Fuzzy Nanogonal Transportation problem.

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	D_1	**D_2**	**D_3**	**Availability(ai)**
O_1	(1,2,0.5,1.5,3 ,2.5,4.5,3.5,4)	(3.3,1.3,0.3,2.5,2.8 , 3.8,4.5,5.8,1.8)	(4,0.5,3.5,2.4,1.2,1 .4,3.2,1,2)	(13,14,15,16,17, 18,10,11,12)
O_2	(2,2.4,1,3,2.6, 2.7,1.7,1.3,1.9)	(1.2,3,5.7,1.5,2.3, 5,1.6,1.8,2.9)	(1.7,1.3,1.4,1,1.1, 1.2,2,4,2.1)	(11,12,13,14,15, 16,17,7,9)
O_3	(1.7,1.6,2.4,1.3,2. 6, 2.7,1.8,2.8,2.5)	(6,7,8,9,1, 2,3,4,5)	(9,12,15,17,20 ,23,3,5,7)	(19,21,23,24,4, 6,8,10,16)
Require Ment (bj)	(20,24,26,27,1 ,3,6,9,17)	(15,17,19,1,3,5, 7,12,13)	(12,14,16,17,18, 19,9,10,11)	

NFNTP convert into Crisp Number

	D_1	**D_2**	**D_3**	**Supply**
O_1	2.5	2.8	2.0	14
O_2	2.0	2.3	1.4	13
O_3	2.4	5.0	12	16
Demand	17	12	14	

The Cost value = (1x0)+(16x0)+(12x 2.8)+(1 x 2)+(13x0)
= 0+0+33.6+2+0
= Rs. 35.6

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Comparision Table / Result

S.No.	NWCM	LCM	VAM	PROPOSED METHOD
1.	242	94.7	94.7	35.6

Conclusion

The proposed method expresses the desirable solution of Neutrosophic Fuzzy Nanogonal Transportation problem. For this we have introduced new technique measures of central tendency method (MCTM) to convert NFNTP into a Crisp Number. This method is easy to approach and the Optimal Value is comparatively lower than the already existing methods.

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