AN OPTIMUM SOLUTION WITH HEXAGONAL NUMBERS BY USING DOMINANCE PROPERTY

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ABSTRACT

In this paper proposes the method to solve dominance property consider the matrix game taken as Hexagonal fuzzy numbers and using ranking technique. It has different ways to this matrix game solved by dominance property. The intent of this research is to identify the value of the game.

Key Words: Hexagonal Numbers, dominance property, Graphical method.

I. INTRODUCTION

In today's real life, they are many complex situations in engineering and business, in which experts and decision markers struggle with uncertainty and hesitation. In many practical situations, collection of crisp data of various parameters is difficult due to lack of exact communications, error in data, market knowledge and customer's satisfaction. The information available is sometimes vague and insufficient. While a decision marker is used to characterize a real-world issue involving incertitude, fuzzy sets are the result. The exact evaluation of membership values cannot be feasible due to insufficient data. Additionally, it is unattainable to evaluate non-membership values. In order to cope without unreliable data when making decisions as well as thrive in an indeterministic surroundings, Bellman and Zadeh [1] established the idea of fuzziness.

Study on hexagonal fuzzy number with R. Pavithra and Rosario[2]. Intuitionistic fuzzy set theory gave more information about the problem than fuzzy set theory did. As an outcome, intuitionistic fuzzy set theory has been applied by many academics in a variety of academic fields [1–9]. It is often hard to fully convey the statistical information underlying a decision-making dilemma. Thus, it might be represented by fuzzy numbers. For expressing fuzzy numbers, membership functions' triangular and trapezoidal geometries are commonly used in research [10–14]. In order to wrestle to arriving at an entirely ambiguous agreement, Srinivasan and Karthikeyan [15] explored a two-stage cost-limiting fuzzy transportation problem when inventories and demand both involve fuzzy numbers. In challenging circumstances where things are unclear. To address transportation concerns, Srinivasan et al. have implemented a suggested technique employing trapezoidal fuzzy numbers [10]. Contrary to this, intuitionistic fuzzy numbers in dubious problem scenarios provide more details and imply significant ambiguity.

The hexagonal fuzzy number having its dominant attribute is formulated in this study as a cost to account for both supply and demand ambiguity and hesitancy. The new ranking measure proposed in this paper proves to be efficient over the other fuzzy ranking existing techniques.

II. PRELIMINARIES

Definition 2.1: Fuzzy numbers are defined as a) a normal and convex fuzzy set; b) a support that is bounded; and c) a fuzzy set A of the real line R with membership function A(x): R [0,1].Each in [0,1] has an intervals that should been closed.

Definition 2.2: The hexagonal fuzzy number H is a fuzzy integer. The function of membership of the hexagonal fuzzy number AH, denoted by (a, b, c, d, e, f; 1), is shown the following:

$$\mu AH(x) = \begin{cases} \frac{y-a}{b-a}, a \le y \le b \\ 1, b \le y \le b \\ \frac{d-y}{d-c}, a \le y \le d \\ 0, otherwise \\ \frac{y-c}{d-c}, c \le y \le d \\ 1, d \le y \le e \\ \frac{f-y}{f-c}, e \le y \le f \\ 0, \quad otherwise \end{cases}$$

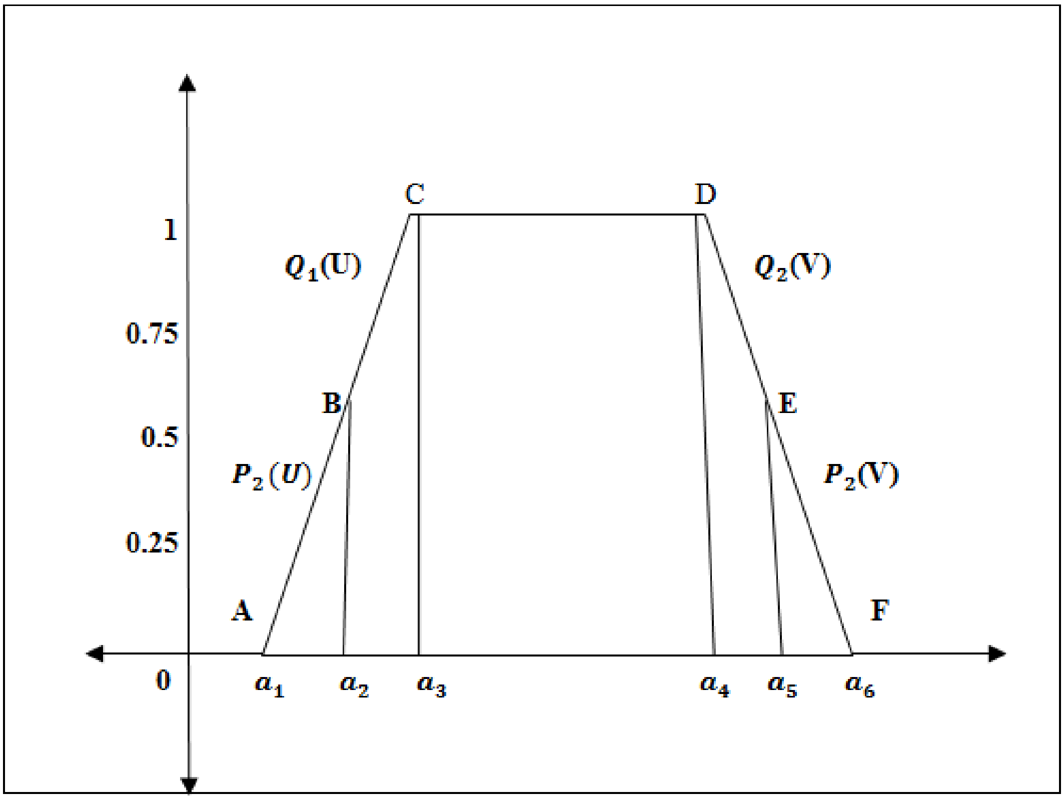


Figure 2.1 Hexagonal Fuzzy

Definition 2.3: Assuming A_H=(a_1,a_2,a_3,a_4,a_5,a_6) and B_H=(b_1,b_2,b_3,b_4,b_5,b_6) are two fuzzy hexagonal numbers that can be combined in a variety of ways.

- Addition $A_H + B_H = (a_1 + b_1, a_2 + b_2, a_3 + b_3, a_4 + b_4, a_5 + b_5, a_6 + b_6)$
- Subtraction $A_H - B_H = (a_1 - b_6, a_2 - b_5, a_3 - b_4, a_4 - b_3, a_5 - b_2, a_6 - b_1)$
- Multiplication $A_H * B_H = (a_1 * b_1, a_2 * b_2, a_3 * b_3, a_4 * b_4, a_5 * b_5, a_6 * b_6)$

Definition 2.4: The extent to which a using Hexagonal fuzzy number A_H = (a_1,a_2,a_(3),a_4,a_5,a_6) is specified as the ranking methodology depending on the CC approach applying the definition given above.

$$R(CC_H) = \left(\frac{2a_1+3a_2+4a_3+3a_4+3a_5+2a_6}{18}, \frac{5}{18}\right)$$

III. DOMINANCE PROPERTY

The more effective approaches are deemed to predominate the lesser ones when it appears that a single of each player's purest approaches remains better than a minimum one of the others.

A. GENERAL RULES

If each request in a single row, say k^{th}, is fewer than (or) equivalent to each component in another row, say r^{th}, then k^{th} row is overpowered by r^{th} row. Similarly, if every component in a column, say k^{th}, exceeds than (or) equivalent to every component in another column, say r^{th}, then k^{th} column is predominated by r^{th} column. (ii)Dominated rows (or) columns may be removed to make the pay off matrix smaller while maintaining the effectiveness of the best possible techniques.

B. THE MODIFIED DOMINANCE PROPERTY

The supremacy of pure tactics is not the only foundation for the prevailing attribute. If two or more different pure strategies are included into a particular approach, it is also referred to as being dominant.

In a broader sense, the i^{th} row can be eliminated if any convex linear combination of certain rows exceeds the i^{th} row. Similar rationales apply to columns.

C. NUMRICAL EXAMPLE

Think about a transportation problem using fuzzy numbers that are hexagonal,

	d_1	d_2	d_3	d_4	Supply
o_1	(3,7,11,15,19,24)	(13,18,23,28,33,40)	(6,13,20,28,36,45)	(15,20,25,31,38,45)	(6,8,11,14,19,25)
o_2	(16,19,24,29,34,39)	(3,5,7,9,10,12)	(5,7,10,13,17,21)	(20,23,26,30,35,40)	(9,11,13,15,18,20)
o_3	(11,14,1721,25,30)	(7,9,11,14,18,22)	(2,3,4,6,7,9)	(5,7,8,11,14,17)	(7,9,11,13,16,20)
Demand	(3,4,5,6,8,10)	(3,5,7,9,12,15)	(6,7,9,11,13,16)	(10,12,14,16,20,24)	(2,3,4,5,6,7)

Solution:

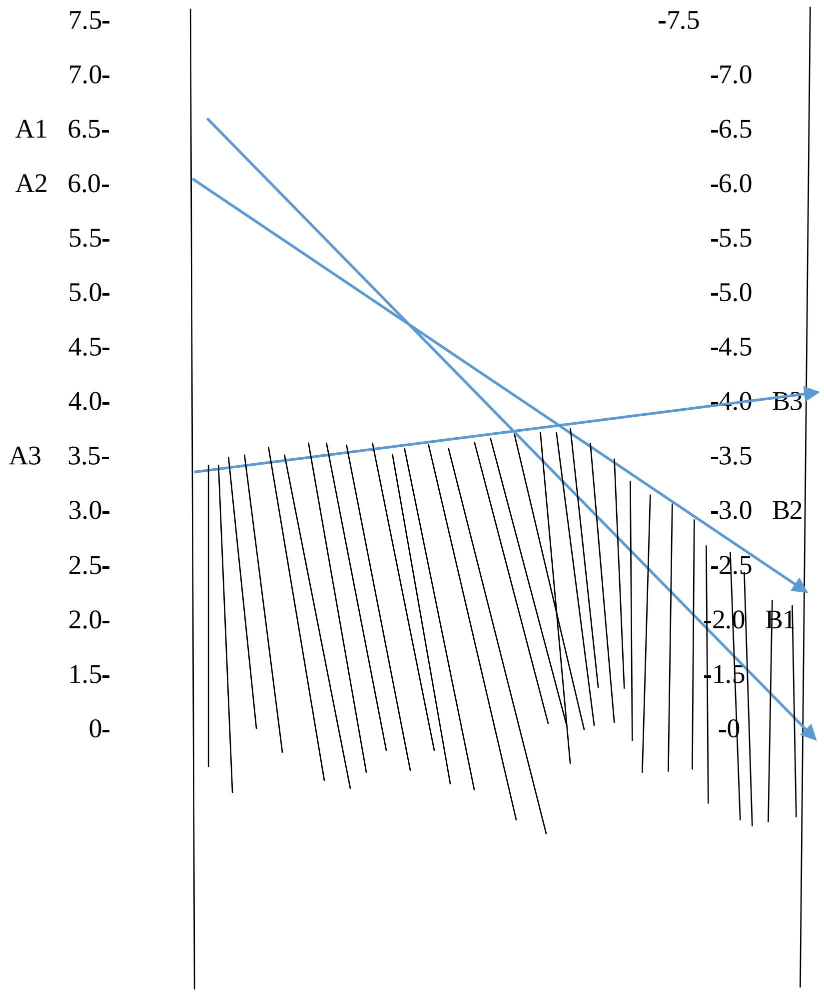
Using ranking technique the rank of hexagonal fuzzy cost matrix is obtained.

$$\begin{pmatrix} 3.87 & 6.71 & 6.37 & 7.52 & 3.53 \\ 6.98 & 2.01 & 3.09 & 7.53 & 4.19 \\ 5.09 & 3.47 & 1.33 & 2.65 & 3.27 \\ 1.54 & 2.19 & 2.67 & 4.14 & 1.17 \end{pmatrix}$$

Proceeding by dominance property, the original 5×4 matrix can be reduced to 3×2 matrix, ie. The payoff matrix,

$$\begin{pmatrix} 6.71 & 6.37 & 3.53 \\ 2.01 & 3.09 & 4.19 \end{pmatrix}$$

Applying graphical method,



The cost matrix 3×2 can be reduced by 2×2 matrix, then determine the game's worth.

$$\begin{pmatrix} 6.71 & 3.53 \\ 2.01 & 4.19 \end{pmatrix}$$

By using mixed method formula we get,
Then the value of the game γ =3.92

IV. CONCLUSION

This paper proposes a value of the game,whose costs are taken as hexagonal fuzzy numbers. For future research we propose effective implementation of the hexagonal fuzzy numbers in all fuzzy problems. Further operational research studies might use a similar method for resolving intuitionistic fuzzy situations.

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