WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Decision Making Problem in Enneadecagonal Fuzzy Number

V.Raju

Assistant Professor, Department of Mathematics
School of basic sciences
Vels Institute of Science, Technology and Advanced Studies (VISTAS),
Chennai-600 117, India
E-mail: raju.v.sbs@velsuniv.ac.in

ABSTRACT :

The purpose of this article is to obtain the fuzzy decision making problem (FDMP) using Enneadecagonal fuzzy number. We instigate the value of Payoff matrix by Enneadecagonal fuzzy number. We adapt the fuzzy decision making problem into crisp valued decision making problem by means of ranking to pay off. The crisp valued decision making problem can be competently established with savage mini max regret criterion.

Keywords: Fuzzy decision making problem (FDMP), Enneadecagonal fuzzy number, membership function, Pay off matrix.

1. Introduction:

Fuzzy decision making has been introduced by Bellman and Zadeh [1]. In the decision making problem the alternatives from which the conclusion has to be taken must be determined. There are different types in decision making. Decision making in a particular issue may vary between person to person. A single person is accountable for taking decisions are individual decision making. Several persons are meeting and transforming practiced knowledge from various persons are utilized to make decisions are Multi person decision making. Proper informations are to be collected for making better decision. Decision making is an activity which includes the steps to be taken for choosing a suitable alternative from those that needs for realizing a certain plan. Jain [2] was the first to propose method of ranking fuzzy numbers for decision making in fuzzy related situation. V.Raju and Jayagopal [3] was the first to introduce the Enneadecagonal fuzzy number. Many decisions are taken based on the collection of data. Decision makers are applying Enneadecagonal fuzzy numbers rather than real numbers to express their judgments. Collections of facts are important to conclude the decision. Solving problems and making decisions are indispensable skills for business and life. Problem solving shows the importance of decision making. Decision making is very important for management and leadership. In current circumstances there are many procedure and techniques to get better the decision making and the value of decision making.

In this article, we have used decision making problem in which imprecise values are Enneadecagonal fuzzy number. We have performed it with converting to crisp valued decision making problem using ranking technique. We have expounded fuzzy decision making problem using Enneadecagonal fuzzy number with examples

2. PRELIMINARIES

In this section, we give the preliminaries that are required for this study.

Definition 2.1. *A fuzzy set A is defined by* $A = \{(x, \mu_A(x)) : x \in A, \mu_A(x) \in [0,1]\}$. *Here* x *is crisp set A and* $\mu_A(x)$ *is membership function in the interval* [0,1].

Definition 2.2. *The fuzzy number A is a fuzzy set whose membership function must satisfy the following conditions.*

(i) A fuzzy set A of the universe of discourse X is convex

(ii) A fuzzy set A of the universe of discourse X is a normal fuzzy set if $x_i \in X$ exists

(iii) $\mu_A(x)$ is piecewise continuous

Definition 2.3 *An α-cut of fuzzy set A is classical set defined as* ${}^{\alpha}[A] = \{x \in X | \mu_A(x) \geq \alpha\}$

Definition 2.4 A fuzzy set A is a convex fuzzy set iff each of its α-cut ${}^{\alpha}A$ is a convex set.

2.5 Ranking of Enneadecagonal fuzzy number:

Let I be a normal Enneadecagonal fuzzy number. The value $M(I)$, called as measure of I is calculated as

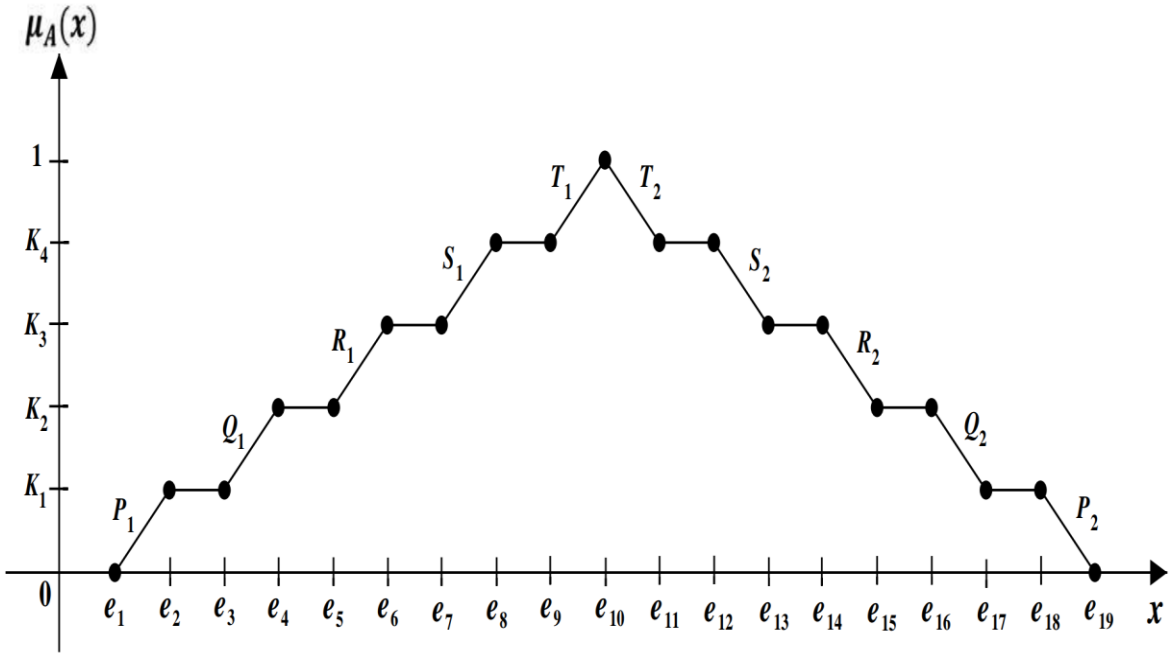
$$M(I) = \frac{e_1 + e_2 + e_3 + e_4 + e_5 + e_6 + e_7 + e_8 + e_9 + e_{10} + e_{11} + e_{12} + e_{13} + e_{14} + e_{15} + e_{16} + e_{17} + e_{18} + e_{19}}{19}$$
$$where\ \ 0 \le k_1 \le k_2 \le k_3 \le k_4 \le 1$$

Definition 2.6 [2]

A fuzzy number A = $(a_1, a_2, a_3, a_4, a_5, a_6, a_7, a_8, a_9, a_{10}, \ldots\ldots a_{19})$ is Enneadecagonal fuzzy number and its membership function is given by

$$\mu_E(x) = \begin{cases} 0,\ for\ x < e_1 \\ k_1\left(\frac{x - e_1}{e_2 - e_1}\right),\ for\ e_1 \le x \le e_2 \\ k_1,\ for\ e_2 \le x \le e_3 \\ k_1 + (k_2 - k_1)\left(\frac{x - e_3}{e_4 - e_3}\right),\ for\ e_3 \le x \le e_4 \\ k_2,\ for e_4 \le x \le e_5 \\ k_2 + (k_3 - k_2)\left(\frac{x - e_5}{e_6 - e_5}\right),\ for\ e_5 \le x \le e_6 \\ k_3,\ e_6 \le x \le e_7 \\ k_3 + (k_4 - k_3)\left(\frac{x - e_7}{e_8 - e_7}\right),\ for\ e_7 \le x \le e_8 \\ k_4,\ for\ e_8 \le x \le e_9 \\ k_4 + (1 - k_4)\left(\frac{x - e_9}{e_{10} - e_9}\right),\ for\ e_9 \le x \le e_{10} \\ k_4 + (1 - k_4)\left(\frac{e_{10} - x}{e_{11} - e_{10}}\right),\ for\ e_{10} \le x \le e_{11} \\ k_4,\ for\ e_{11} \le x \le e_{12} \\ k_3 + (k_4 - k_3)\left(\frac{e_{12} - x}{e_{13} - e_{12}}\right),\ for\ e_{12} \le x \le e_{13} \\ k_3,\ for\ e_{13} \le x \le e_{14} \\ k_2 + (k_3 - k_2)\left(\frac{e_{14} - x}{e_{15} - e_{14}}\right),\ for\ e_{14} \le x \le e_{15} \\ k_2,\ for \quad e_{15} \le x \le e_{16} \\ k_1 + (k_2 - k_1)\left(\frac{e_{16} - x}{e_{17} - e_{16}}\right),\ for\ e_{16} \le x \le e_{17} \\ k_1,\ for\ e_{17} \le x \le e_{18} \\ k_1\left(\frac{e_{18} - x}{e_{19} - e_{18}}\right),\ for\ e_{18} \le x \le e_{19} \\ 0,\ for\ x > e_{19} \end{cases}$$

3. Diagram of Enneadecagonal fuzzy number:



3.1 Mathematical formulation of Fuzzy Decision making problem:

Consider a fuzzy decision making problem in which all the entries of the payoff matrix are Enneadecagonal fuzzy numbers. Let us obtain the problem R has m strategies and problem S has n strategies. Then the payoff matrix m x n is

$$A=\begin{pmatrix} r_{11} & r_{12} & . & r_{1n} \\ r_{21} & r_{22} & . & r_{2n} \\ . & . & . & . \\ r_{m1} & r_{m2} & . & r_{mn} \end{pmatrix}$$

3.2 Procedures for solving Savage Minimax regret criterion:

Step 1: Construct a regret (opportunity loss) table of each alternative for every state of nature from

4. Numerical example:

Let us consider the Matrix

$$\begin{bmatrix} \begin{pmatrix} -4,-3,-2,-1, \\ 0,1,2,3,4,5,6, \\ 7,8,9,10,11, \\ 12,13,14 \end{pmatrix} & \begin{pmatrix} -3,-2,-1,0, \\ 1,2,3,4,5,6, \\ 7,8,9,10,11, \\ 12,13,14,15 \end{pmatrix} & \begin{pmatrix} 1,2,3,4,5,6 \\ 7,8,9,10,11 \\ 12,13,14,15 \\ 16,17,18, \end{pmatrix} \\ \begin{pmatrix} -3,-2,-1,0, \\ 1,2,3,4,5,6, \\ 7,8,9,10,11, \\ 12,13,14,15 \end{pmatrix} & \begin{pmatrix} -2,-1,0,1,2, \\ 3,4,5,6,7,8, \\ 9,10,11,12, \\ 13,14,15,16 \end{pmatrix} & \begin{pmatrix} 0,1,2,4,5,6 \\ 7,8,9,10,11, \\ 12,13,14,16, \\ 18,20,22,24 \end{pmatrix} \\ \begin{pmatrix} 0,1,2,3,4,5, \\ 6,7,9,10,11, \\ 13,14,15,17, \\ 19,21,22,25 \end{pmatrix} & \begin{pmatrix} 1,2,3,6,8,9,10, \\ 12,13,15,16,17 \\ 19,20,22,23, \\ 25,28,30 \end{pmatrix} & \begin{pmatrix} -3,-2,-1,0, \\ 1,2,3,4,5,6, \\ 7,8,9,10,11, \\ 12,13,14,15 \end{pmatrix} \end{bmatrix}$$

This problem is solved by taking the values *for* $k_1 = \frac{1}{5}, k_2 = \frac{2}{5}, k_3 = \frac{3}{5}, k_4 = \frac{4}{5}$. We obtain the values of Measure of matrix A and is denoted by $\mu_{EDC}(a_{ij})$

a_{11}	-4,-3,-2,-1,0,1,2,3,4,5,6,7,8,9,10,11,12,13,14	$\mu_{EDC}(a_{11}) = 5$
a_{12}	-3,-2,-1,0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15	$\mu_{EDC}(a_{12}) = 6$
a_{13}	1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19	$\mu_{EDC}(a_{13}) = 10$
a_{21}	-3,-2,-1,0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15	$\mu_{EDC}(a_{21}) = 6$
a_{22}	-2,-1,0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16	$\mu_{EDC}(a_{22}) = 7$
a_{23}	0,1,2,4,5,6,7,8,9,10,11,12,13,14,16,18,20,22,24	$\mu_{EDC}(a_{23}) = 10.63$
a_{31}	0,1,2,3,4,5,6,7,9,10,11,13,14,15,17,19,21,22,25	$\mu_{EDC}(a_{31}) = 10.68$
a_{32}	1,2,3,6,8,9,10,12,13,15,16,17,19,20,22,23,25,28,30	$\mu_{EDC}(a_{32}) = 14.16$
a_{33}	-3,-2,-1,0,1,2,3,4,5,6,7,8,9,10,11,12,13,14,15	$\mu_{EDC}(a_{33}) = 6$

Step 2: The given fuzzy decision making problem is reduced to the following payoff profit matrix

Alternatives	Expected level of Sale (in Rupees)		
	I	II	III
Rice	5	6	10
Wheat	6	7	10.63
Sugar	10.68	14.16	6

Step 3: The opportunity loss table for each alternative with the states of nature is depicted below

Alternatives	Expected level of Sale (in Rupees)		
	I	II	III
Rice	5.68	8.16	0.63
Wheat	4.68	7.16	0
Sugar	0	0	4.63
Column Maximum	10.68	14.16	10.63

Step 4: The opportunity loss table and the maximum loss in each row is entered and shown in the below table

Alternatives	Expected level of Sale (in Rupees)			Decision Column (Maximum Loss)
	I	II	III	
Rice	5.68	8.16	0.63	8.16
Wheat	4.68	7.16	0	7.16
Sugar	0	0	4.63	4.63

Result: Since the minimum of maximum loss is in alternative Sugar = 4.63 rupees, this alternative must be selected.

5. Conclusion:

In this article, we have described and solved fuzzy decision making problem and its pay off matrix whose elements are Enneadecagonal fuzzy number. We have illustrated the alternative selection of the fuzzy valued decision making problem converting to crisp valued decision making problem using ranking techniques. The Crisp valued decision making problem is solved by savage minimax regret criterion

REFERENCES:

[1] L.A. Zadeh, , Fuzzy sets, Information and Control, 8(3) ,1965, 338-353.

[2] R.E.Bellman and L.A.Zadeh, Decision making in fuzzy environment, Management Science, 17, 1970, 141- 164.

[3] V. Raju and R. Jayagopal, ''A new operation on Icosikaitetragonal fuzzy number'', Journal of Combinatorial Mathematics and Combinatorial Computing ,Volume 112(2020), Page no : 127- 136

[4] V.Raju and S.Ramachandran "Icosagonal fuzzy number in decision making problem"
International Journal of Trend in Scientific Research and Development , Volume 5,Issue 6,2021, Page no : 1194-1199

[5] S. Sasikumar and V.Raju '' Study on Fuzzy game problem in Icosikaitetragonal Fuzzy number'' Annals of Romanian Society for Cell biology , Volume 25,Issue 6, 2021, Page No : 10500-10508

[6] V.Raju and S.Maria Jesu Raja ''An Approach on Fuzzy game problem in Icosikaioctagonal Fuzzy number'' Journal of Xidian University, Volume 14, Issue 4, 2020, Page no: 1009-1016

[7]V.Raju and S.Arul Amirtha Raja " Study on fuzzy sequencing problem in Icosikaioctagonal Fuzzy Numbers'' Journal of Xidian University, Volume 14, Issue 4, 2020, Page no: 3829-3837

[8] V.Raju and S.Maria Jesu Raja '' Fuzzy decision making problem in Icosikaioctagonal Fuzzy number'' Journal of Xidian University, Volume 14, Issue 5, 2020, Page no: 3240-3248

[9] R. Deepa and V. Raju ''Solving Fuzzy Transportation Problem using Icosikaioctagonal Fuzzy Numbers'' Journal of Shanghai Jiaotong University, Volume 16, Issue 7,2020 Page No: 162-173

[10] S.Maria Jesu Raja and V.Raju '' Elucidating Fuzzy Assignment problem Employing Icosikaioctagonal Fuzzy Number '' Journal of Xi'an University of Architecture and Technology , Volume 12, Issue 6, 2020 ,Page no : 1681-1688

[11] V.Ashok Kumar and V.Raju '' An Approach on Fuzzy Assignment problem in Icosagonal Fuzzy Number '' Journal of Xi'an University of Architecture and Technology, Volume 12, Issue 5, 2020 ,Page no : 3487-3493

[12] V.Raju and M.ParuvathaVathana "Discourse on Fuzzy Game Problem in Icosagonal Fuzzy Number '' International journal of scientific research and review volume 8, Issue 3, 2019, Page no: 1384-1390

[13] V.Raju , Ranking Function on Icosagonal Fuzzy Number for Solving Fuzzy Transportation Problem, ''Journal of Applied Science and Computations '' Volume VI, Issue IV, 2019, Page No: 3631-3640

[14] V.Raju and M.ParuvathaVathana "An Icosagonal Fuzzy Number for solving Fuzzy Sequence Problem'' International journal of Research in Engineering, IT and Social Sciences'' Volume 9, Issue 5, 2019. Page no: 37-40

[15] V.Raju and M.ParuvathaVathana " Fuzzy Critical path method with Icosagonal Fuzzy Numbers using Ranking Method'' A Journal of Composition Theory, Volume 12, Issue 9, 2019, Page no: 62-69

[16] V. Raju and R. Jayagopal "An Approach on Icosikaioctagonal Fuzzy number-Traditional Operations on Icosikaioctagonal fuzzy number" A Journal of composition theory, Vol.XII, Issue X, 2019, Page No: 727-734

[17] V. Raju and R. Jayagopal "An Arithmetic Operations of Icosagonal fuzzy number Using Alpha cut "International Journal of Pure and Applied Mathematics. Volume 120, No. 8, 2018, 137-145

[18]V. Raju and R. Jayagopal'' A Rudimentary Operations on Octagonal Fuzzy Numbers '' International Journal of Research in Advent Technology Vol.6, No.6, June 2018,Page No: 1320-1323

[19] V.Raju and M.Paruvatha Vathana '' Graceful labeling for some complete bi partite garaph'' Journal of computer and Mathematical sciences , Volume 9,Issue 12 ,2018, Page no : 2147-2152

[20] R.Jayagopal and V.Raju ''Domination Parameters in shadow graph and Path connected graph'' International Journal of mathematics and its Applications , volume 6, Issue 2B,2018 , Page no : 167-172

[21] K. Arulmozhi , V. Chinnadurai ''Bipolar fuzzy soft hyper ideals of ordered –hypersemigroups Γ ''International Journal of Scientific Research and Review Volume 8, Issue 1, 2019, Page No: 1134-1140