Plıthogenıc Combıned Dısjoınt Block Fuzzy Cognıtıve Maps (Pcdbfcm)

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Abstract

This research article represents an innovative concept in Plithogenic Combined Disjoint Block Fuzzy Cognitive Maps (PCDBFCM) and its applications. PCDBFCM is a very useful tool in grouping the factors with contradiction degree of multiple attributes. A plithogenic fuzzy matrix is used to represent the connection matrix. The resultant vector is obtained while using plithogenic fuzzy operators. The produced results are very useful in making decisions since they include the degree of conceptual node contradiction with respect to the dominant node. For the plithogenic aggregation operators, the degree of dissimilarity between each attribute value and the main attribute value of the attribute leads to increased accuracy.

Keywords: PCDBFCM; Disjoint Block Fuzzy Cognitive Maps; Plithogenic Cognitive Maps; Plithogenic fuzzy operators; Nodes; Causalities t-norm, t-conorm; impact factors of happiness in family

1. Introduction

A cognitive map is any visible representation of a group's mental model for a given concept. It is introduced by Edward Tolman in 1948. The advancement of a cognitive map is a fuzzy cognitivemap. It is introduced by L.A. Zadeh (1965) for handling, creating, and using models of uncertainty and complex processes and systems. In 1976, R. Axelrod [1] focused on the cognitive map in political decisions. The idea of the Fuzzy Cognitive Map is developed by Bart Kosko [3] in the year 1986. In order to ease the handling of large numbers of attributes, W. B. Vasantha Kandasamy in 2003 [2] introduced Combined Disjoint Block Fuzzy Cognitive Maps. Based on this, A.Victor Devadoss discovered the major impact of happiness on family life in 2013 [4] using Combined Disjoint Block Fuzzy Cognitive Maps. The Plithogenic set is initiated by Smarandache [5], to handle multi-attribute with their inherent contradiction degree in decision making problems. The Plithogenic cognitive map is a progress of the Fuzzy cognitive map, the Intuitionistic cognitive map, and the neutrosophic cognitive map, by Nivetha Martin and Smarandache [7]. The extension of the fuzzy cognitive map with the contradiction and degree of appurtenance of attributes is PCM. In this paper, we study how the PCDBFCM is applied in the decision making of various criteria which considers multi values of attributes. An extension of PCM, R. Priya and Nivetha Martin [9] proposed a new concept of induced Plithogenic Cognitive Maps. In order, R. Priya and

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Nivetha [10] introduced a new model of Plithogenic sub cognitive map. For the first time, the discussion of Plithogenic Combined Disjoint Block FCM (PCDB FCM) is applied in the analysis of the impact of the role of happiness in the family [4].

2. Discussion

This segment represents phases to attain the hidden chain by using PCDBFCM
Phase 1: The characteristics $R_1, R_2, R_3,$ ---------- R_n are the vertex of the given problem, depending on the expert's discernment
Phase 2: From the expert's view, the vertex is divided into four groups. These groups must be disjoint block matrix. Then combining all the matrix generates a new plithogenic combined disjoint block.
Phase 3: The connection matrix is assigned by the linguistic variable and then quantified by the trapezoidal fuzzy number. Then, the quantified trapezoidal fuzzy numbers are converted into crisp using average method.
Phase 4: The attribute Loneliness is a predominant attribute and made an on-position vector
Phase 5: To obtain the resultant vector by using plithogenic logical aggregation operators
Phase 6: In the present plithogenic study, the on-position vector threshold is considered as 1. When the values are less than 0.5, then the value considered is the same and if the values are equal or more than 0.5, then the value is considered as 1. The plithogenic threshold represents a modified resultant vector. This method is repeated until a hidden chain is attained.

3. Practical Example

A. The Neutrosophic Context of the Problem

Now it is analyzed that the problems factors of role happiness in family [4]using PCDFCM.In using the linguistic questionnaire and the expert's opinion we have taken the following 16 attributes as a problem that impact the happiness in family
R_1– Loneliness
R_2– Frustration
R_3 - Economic conditions
R_4 - Conflicting thoughts / misunderstanding
R_5 - Social and religious values
R_6- Faithfulness
R_7 - Physical Illness
R_8- Loss of dear ones
R_9– Faultlessness
R_{10}– Negligence
R_{11} - High expectations
R_{12} - Family pressure
R_{13} - Family Status /background
R_{14}- Child rearing issues
R_{15} - Lack of tolerance
R_{16} - Adamant character
The above sixteen attributes are divided into four groups namelyB_1, B_2, B_3, B_4 .Each group consists of four attributes and the matrix is connected with PCDFM.
Let $B_1 = \{R_1, R_7, R_{12}, R_{13}\} B_2 = \{R_3, R_5, R_{11}, R_{16}\} B_3 = \{R_2, R_6, R_8, R_{14}\} B_4 = \{R_4, R_9, R_{10}, R_{15}\}$.
Now from several expert opinion, each connection matrix is assigned by qualitative variables and it is evaluated by trapezoidal fuzzy number

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Quantification of Linguistic variable

Table 1: represents Evaluation of Qualititative variable

Linguistic Variable	Trapezoidal fuzzy number	Crisp value
Very Low	(0,0.06,0.12,0.18)	0.09
Low	(0.18,0.24,0.30,0.36)	0.27
Medium	(0.36,0.42,0.48,0.54)	0.45
High	(0.54,0.60,0.66,0.72)	0.63
Very High	(0.72,0.78,0.84,1)	0.84

Case 1

From the expert opinion for the first groupB_1= $\{R_1, R_7, R_{12}, R_{13}\}$,the directed graph is given by

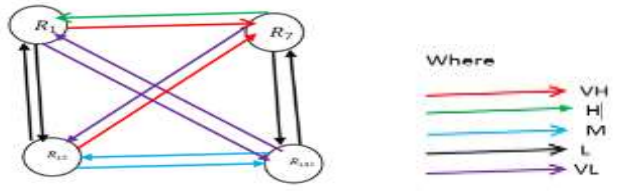

Figure 1: Graphical representation of the first group

In the first group,B_1 = $\{R_1, R_7, R_{12}, R_{13}\}$ the expert's opinion, each attribute is assigned a linguistic variable. Based on expert opinions, it is identified that the attribute "loneliness" is very highly connected with physical illness, lowly connected with family pressure, and very lowly connected with family status. The link between physical illness and loneliness is strong, but the link between physical illness and family pressure is weak, and the link between physical illness and family background is weak. Family pressure is lowly connected with loneliness, very highly connected with physical illness, and neutrally connected with family status. The factors of family background and loneliness are very lowly connected, family background and physical illness are lowly connected, and family background and family pressure are neutrally connected.

Let B_1be the directed graph of the plithogenic fuzzy connection matrix given in figure 1.

$$\begin{array}{c} \\ R_1 \\ R_7 \\ R_{12} \\ R_{13} \end{array} \begin{array}{c} \begin{array}{cccc} R_1 & R_7 & R_{12} & R_{13} \end{array} \\ \begin{bmatrix} 0 & VH & L & VL \\ H & 0 & VL & L \\ L & VH & 0 & M \\ VL & L & M & 0 \end{bmatrix} \end{array}$$

The plithogenic fuzzy connection matrix with a trapezoidal fuzzy number as given by expert opinion is as follows.

$$\begin{array}{c} \\ R_1 \\ R_7 \\ R_{12} \\ R_{13} \end{array} \begin{array}{c} \begin{array}{cccc} R_1 & R_7 & R_{12} & R_{13} \end{array} \\ \begin{bmatrix} 0 & 0.84 & 0.27 & 0.09 \\ 0.63 & 0 & 0.09 & 0.27 \\ 0.27 & 0.84 & 0 & 0.45 \\ 0.09 & 0.27 & 0.45 & 0 \end{bmatrix} \end{array}$$

Let us consider the attribute R_1- Loneliness is a dominant attribute in the first group, therefore R_1 – Loneliness is an on-position vertex and the other vertex is an off position. The contradiction degree between these attributes is as follows

Table 2 :contradiction of attribute of first group

Attribute	$\mathbf{R_1}$	$\mathbf{R_7}$	R_{12}	R_{13}
Dominant degree	0	$\frac{1}{4}$	$\frac{2}{4}$	$\frac{3}{4}$

Let I = (1 0 0 0)be the instantaneous state vector of the first group.

Let I $*_p$P (B_1) = (a, b, c, d)

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$a = \text{Max}[1 \wedge_p 0,\ 0 \wedge_p 0.63,\ 0 \wedge_p 0.27,\ 0 \wedge_p 0.09]$

$b = \text{Max}[1 \wedge_p 0.84,\ 0 \wedge_p 0,\ 0 \wedge_p 0.84,\ 0 \wedge_p 0\ 27]$

$c = \text{Max}[1 \wedge_p 0.27,\ 0 \wedge_p 0.09,\ 0 \wedge_p 0,\ 0 \wedge_p 0.45]$

$d = \text{Max}[1 \wedge_p 0.09, 0 \wedge_p 0.27, 0 \wedge_p 0.45,\ 0 \wedge_p 0]$

$I *_p P(B_1) = (0, 0.88, 0.64, 0.77) \rightarrow (1,1,1,1) = I_1$

$I_1 *_p P(B_1) = (0.63, 0.88, 0.73, 0.86) \rightarrow (1,1,1,1) = I_2$

$I_1 = I_2$(Fixed point)

Hence, the hidden pattern of the plithogenic fuzzy cognitive map is a fixed point. It means that loneliness is bound up with physical illness, family pressure, and family status. In general, loneliness spoils family relationships.

Case 2

From the expert opinion for the second group, $B_2 = \{R_3, R_5, R_{11}, R_{16}\}$, the directed graph is given by

Figure 2 : Graphical representation of the second group

In the second group, $B_2 = \{R_3, R_5, R_{11}, R_{16}\}$, the expert's opinion, each attribute is assigned a linguistic variable. Based on the matrix, the attribute Economic conditions is very highly connected with the Social and religious values, neutrally connected with the High expectations and very highly connected with Adamant character. The factor, Social and religious values are lowly connected with Economic conditions, Social and religious values are neutrally connected with High expectations, and also the Social and religious values are neutrally connected with Adamant character. The attribute between, High expectations and Economic conditions are very highly connected, High expectations and Social and religious values are lowly connected, and also the High expectations and Adamant character is very lowly connected. The Adamant character is very lowly connected with Economic conditions and Adamant character is neutrally connected with Social and religious values.

Here B_2be the directed graph of the plithogenic fuzzy connection matrix given in figure 2

	R_3	R_5	R_{11}	R_{16}
R_3	0	VH	M	VH
R_5	L	0	M	M
R_{11}	VH	L	0	*VL*
R_{16}	VL	*M*	VL	0

The plithogenic fuzzy connection matrix with a trapezoidal fuzzy number as given by expert opinion is as follows.

	R_3	R_5	R_{11}	R_{16}
R_3	0	0. 84	0. 45	0. 84
R_5	0. 27	0	0. 45	0. 45
R_{11}	0. 84	0. 27	0	0. 09
R_{16}	0. 27	0. 45	0. 09	0

Let us consider the attribute R_3-Economic conditions is a predominant attribute in the second group, therefore R_3-Economic conditions is an on-position vertex and the other vertex is an off- position. The contradiction degree of predominant attributes in respect to other attributes as given

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Table 3: contradiction of attribute of second group

Attribute	$\mathbf{R_3}$	$\mathbf{R_5}$	R_{11}	R_{16}
Dominant degree	0	$\frac{1}{4}$	$\frac{2}{4}$	$\frac{3}{4}$

Let I = (1 0 0 0) be the instantaneous state vector of the second group.

I $*_p$ P $(B_2) = (\ 0,0.88,0.73,0.96) \rightarrow (1,1,1,1) = \mathrm{I}_1$

I_1 $*_p$ P $(B_2)(\ 0.84,0.88,0.73,0.96) \rightarrow (1,1,1,1) = \mathrm{I}_2$

$\mathrm{I}_1 = \mathrm{I}_2$(Fixed point)

Thus, hidden pattern of plithogenic fuzzy cognitive map is a fixed point. It represents those Economic conditions affect in the aspect Social and religious values. High expectations creates the problems in happiness of family especially in economic condition. The impact of Economic conditions is creating an Adamant character.

Case 3

From the expert opinion for the third group,$B_3 = \{R_2, R_6, R_8, R_{14}\}$, the directed graph is given by

Figure 3 Graphical representation of the third group

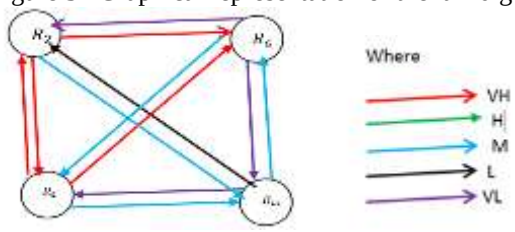

Figure 3: Graphical representation of the third group

In the third group,$B_3 = \{R_2, R_6, R_8, R_{14}\}$, the expert's opinion, each attribute is assigned a linguistic variable. Based on figure, it is identified that the attribute Frustration is very highly connected with the /fidelity, very highly connected with Loss of dear ones and neutrally connected with Child rearing issues. The attribute between, Faithfulness and Frustration are lowly connected, Faithfulness and Loss of dear ones are neutrally connected, and also the Faithfulness and Child rearing issues is very lowly connected. The Loss of dear ones is very highly connected with Frustration, neutrally connected with Faithfulness and very lowly connected with Child rearing issues. The next attribute Child rearing issues and Frustration are lowly connected, Child rearing issues and Faithfulness are neutrally connected and Child rearing issues and Loss of dear ones /significant other are lowly connected.

Here B_3be the directed graph of the plithogenic fuzzy connection matrix given in figure 3.

$$\begin{array}{c} \\ R_2 \\ R_6 \\ R_8 \\ R_{14} \end{array} \begin{array}{c} \begin{array}{cccc} R_2 & R_6 & R_8 & R_{14} \end{array} \\ \begin{bmatrix} 0 & VH & VH & M \\ VL & 0 & M & VL \\ VH & VH & 0 & M \\ L & M & L & 0 \end{bmatrix} \end{array}$$

The plithogenic fuzzy connection matrix with Trapezoidal fuzzy number as given by expert opinion is as follows

$$\begin{array}{c} \\ R_2 \\ R_6 \\ R_8 \\ R_{14} \end{array} \begin{array}{c} \begin{array}{cccc} R_2 & R_6 & R_8 & R_{14} \end{array} \\ \begin{bmatrix} 0 & 0.84 & 0.84 & 0.45 \\ 0.09 & 0 & 0.45 & 0.09 \\ 0.84 & 0.84 & 0 & 0.45 \\ 0.27 & 0.45 & 0.27 & 0 \end{bmatrix} \end{array}$$

Let us choose the node R_2-Frustration is a predominant node in the third group, Therefore R_2-Frustration is an on-position vertex and Faithfulness /fidelity, Loss of dear ones /significant and Child rearing issues are an off position. Therefore, the contradiction degree of predominant attributes in respect to other attributes as given below

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Table 4: contradiction of attribute of third group

Attribute	$\mathbf{R_2}$	$\mathbf{R_6}$	R_8	R_{14}
Dominant degree	0	$\frac{1}{4}$	$\frac{2}{4}$	$\frac{3}{4}$

Let I = (1 0 0 0) be the instantaneous state vector of the third group

I $*_p$ P $(B_3) =$ (0,0.88,0.92, 0.86) $\rightarrow$ (1,1,1,1)= I_1

I_1 $*_p$ P (B_3) = (0.84,0.88,0.92, 0.86) $\rightarrow$ (1,1,1,1)= I_2

$I_1 = I_2$ (Fixed point)

Thus, hidden pattern of plithogenic fuzzy cognitive map is a fixed point. From the fixed point, Frustration creates the problem in the family because of Faithfulness. He/ she felt on Frustration because the Loss of dear ones. The Child rearing issues create Frustration

Case 4

From the expert opinion for the fourth group,$B_4 = \{R_4, R_9, R_{10}, R_{15}\}$, the directed graph is given by

Figure 4 Graphical representation of the third group

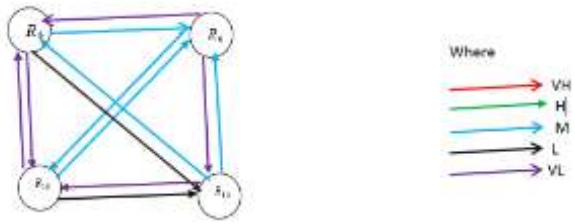

Figure 4: Graphical representation of the third group

In the fourth group,$B_4 = \{R_4, R_9, R_{10}, R_{15}\}$, the expert's opinion, each attribute is assigned a linguistic variable. Based on this map, it is understood that the attribute misunderstanding is neutrally connected with the Faultlessness, very lowly connected with the Negligence and lowly connected with Lack of tolerance. The next attribute Faultlessness are very lowly connected with misunderstanding, neutrally connected with Negligence, and very lowly with Lack of tolerance. The attribute between, Negligence and misunderstanding are very lowly connected, Negligence and Faultlessness are neutrally connected, and also the Negligence and Lack of tolerance are lowly connected. The Lack of tolerance is neutrally connected with misunderstanding and Lack of tolerance, Lack of tolerance very lowly connected with Negligence

Here B_4be the directed graph of the plithogenic fuzzy connection matrix given in figure 3.

$$\begin{array}{c} \\ R_4 \\ R_9 \\ R_{10} \\ R_{15} \end{array} \begin{array}{c} \begin{array}{cccc} R_4 & R_9 & R_{10} & R_{15} \end{array} \\ \begin{bmatrix} 0 & M & VL & L \\ VL & 0 & M & VL \\ VL & M & 0 & L \\ M & M & VL & 0 \end{bmatrix} \end{array}$$

The plithogenic fuzzy connection matrix with Trapezoidal fuzzy number as given by expert opinion is as follows

$$\begin{array}{c} \\ R_4 \\ R_9 \\ R_{10} \\ R_{15} \end{array} \begin{array}{c} \begin{array}{cccc} R_4 & R_9 & R_{10} & R_{15} \end{array} \\ \begin{bmatrix} 0 & 0.45 & 0.09 & 0.27 \\ 0.09 & 0 & 0.45 & 0.09 \\ 0.09 & 0.45 & 0 & 0.27 \\ 0.45 & 0.45 & 0.09 & 0 \end{bmatrix} \end{array}$$

Let us choose an attribute R_4 - misunderstanding is a predominant attribute in the fourth group, thereforeR_4 - misunderstanding is an on-position vertex and other state are an off-position. Therefore, the contradiction degree of predominant attributes with respect to other attributes as given below

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Table 5: contradiction of attribute of third group

Attribute	$\mathbf{R_4}$	$\mathbf{R_9}$	R_{10}	R_{15}
Dominant degree	0	$\frac{1}{4}$	$\frac{2}{4}$	$\frac{3}{4}$

Let I = (1 0 0 0)be the instantaneous state vector of the fourth group.

I $*_p$ P $(B_4) = (0, 0.58, 0.55, 0.82) \rightarrow (1,1,1,1) = I_1$

$I_1 *_p$ P $(B_4) = (0.45, 0.59, 0.73, 0.82) \rightarrow (1,1,1,1) = I_2$

$I_1 = I_2$(Fixed point)

Thus, hidden pattern of plithogenic fuzzy cognitive map is a fixed point. From the fixed point, the happiness of the family affects because of misunderstanding, Faultlessness, Negligence and Lack of tolerance

Case 5

Plithogenic combined disjoint block of fuzzy cognitive map

Let B gives the combined disjoint block connection matrix of the PFCM after combining all four plithogenic fuzzy connection matrices into one resultant matrix. The combined disjoint block of the Plithogenic fuzzy connection matrix with linguistic variables is given below.

	R_1	R_7	R_{12}	R_{13}	R_3	R_5	R_{11}	R_{16}	R_2	R_6	R_8	R_{14}	R_4	R_9	R_{10}	R_{15}
R_1	0	VH	L	VL	0	0	0	0	0	0	0	0	0	0	0	0
R_7	H	0	VL	L	0	0	0	0	0	0	0	0	0	0	0	0
R_{12}	L	VH	0	M	0	0	0	0	0	0	0	0	0	0	0	0
R_{13}	VL	L	M	0	0	0	0	0	0	0	0	0	0	0	0	0
R_3	0	0	0	0	0	VH	M	VH	0	0	0	0	0	0	0	0
R_5	0	0	0	0	L	0	M	M	0	0	0	0	0	0	0	0
R_{11}	0	0	0	0	VH	L	0	VL	0	0	0	0	0	0	0	0
R_{16}	0	O	0	0	L	M	VL	0	0	0	0	0	0	0	0	0
R_2	0	0	0	0	0	0	0	0	0	*VH*	VH	M	0	0	0	0
R_6	0	0	0	0	0	0	0	0	VL	0	M	VL	0	0	0	0
R_8	0	0	0	0	0	0	0	0	VH	VH	0	M	0	0	0	0
R_{14}	0	0	0	0	0	0	0	0	L	M	L	0	*O*	0	0	0
R_4	0	0	0	0	0	0	0	0	0	0	0	0	0	M	VL	L
R_9	0	0	0	0	0	0	0	0	0	0	0	0	VL	0	M	VL
R_{10}	0	0	0	0	0	0	0	0	0	0	0	0	VL	M	0	L
R_{15}	0	0	0	0	0	0	0	0	0	0	0	0	M	M	VL	0

Now the new plithogenic combined disjoint block of plithogenic fuzzy connection matrix B is

	R_1	R_7	R_{11}	R_{13}	R_3	R_5	R_{11}	R_{16}	R_1	R_6	R_8	R_{14}	R_4	R_9	R_{10}	R_{15}
R_1	0	0.84	0.27	0.09	0	0	0	0	0	0	0	0	0	0	0	0
R_7	0.63	0	0.09	0.27	0	0	0	0	0	0	0	0	0	0	0	0
R_{11}	0.27	0.84	0	0.45	0	0	0	0	0	0	0	0	0	0	0	0
R_{13}	0.09	0.27	0.45	0	0	0	0	0	0	0	0	0	0	0	0	0
R_3	0	0	0	0	0	0.84	0.45	0.84	0	0	0	0	0	0	0	0
R_5	0	0	0	0	0.27	0	0.45	0.45	0	0	0	0	0	0	0	0
R_{11}	0	0	0	0	0.84	0.27	0	0.09	0	0	0	0	0	0	0	0
R_{16}	0	0	0	0	0.27	0.45	0.09	0	0	0	0	0	0	0	0	0
R_1	0	0	0	0	0	0	0	0	0	0.84	0.84	0.45	0	0	0	0
R_6	0	0	0	0	0	0	0	0	0.09	0	0.45	0.09	0	0	0	0
R_8	0	0	0	0	0	0	0	0	0.84	0.84	0	0.45	0	0	0	0
R_{14}	0	0	0	0	0	0	0	0	0.27	0.45	0.27	0	*O*	0	0	0
R_4	0	0	0	0	0	0	0	0	0	0	0	0	0	0.45	0.09	0.27
R_9	0	0	0	0	0	0	0	0	0	0	0	0	0.09	0	0.45	0.09
R_{10}	0	0	0	0	0	0	0	0	0	0	0	0	0.09	0.45	0	0.27
R_{15}	0	0	0	0	0	0	0	0	0	0	0	0	0.45	0.45	0.09	0

Let us consider R_1 - Loneliness is a dominant attribute. Therefore, dominant node considers as on state position and all other attributes are off position.

Let I = (1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0) be the instantaneous state vector of PCDFM

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Let I $*_p$ B = (a,b,c,d,e,f,g,h,i,j,k,l,m,n,n,o)

$$a = \text{Max}\begin{bmatrix} 1\wedge_p 0,\ 0\wedge_p 0.63,\ 0\wedge_p 0.27,\ 0\wedge_p 0.09, 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0, \\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0 \end{bmatrix}$$

$$b = \text{Max}\begin{bmatrix} 1\wedge_p 0.84,\ 0\wedge_p 0,\ 0\wedge_p 0.84,\ 0\wedge_p 0.27, 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0, \\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0 \end{bmatrix}$$

$$c = \text{Max}\begin{bmatrix} 1\wedge_p 0.27,\ 0\wedge_p 0.09,\ 0\wedge_p 0,\ 0\wedge_p 0.45, 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0, \\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0 \end{bmatrix}$$

$$d = \text{Max}\begin{bmatrix} 1\wedge_p 0.09, 0\wedge_p 0.27, 0\wedge_p 0.45,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0 \\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0 \end{bmatrix}$$

$$e = \text{Max}\begin{bmatrix} 1\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0.27,\ 0\wedge_p 0.84, 0\wedge_p 0.27, \\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0, 0\wedge_p 0 \end{bmatrix}$$

$$f = \text{Max}\begin{bmatrix} 1\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0, 0\wedge_p 0.84,\ 0\wedge_p 0,\ 0\wedge_p 0.27, 0\wedge_p 0.45, \\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0, 0\wedge_p 0 \end{bmatrix}$$

$$g = \text{Max}\begin{bmatrix} 1\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0, 0\wedge_p 0.45, 0\wedge_p 0.45,\ 0\wedge_p 0.0, 0\wedge_p 0.09, \\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0, 0\wedge_p 0 \end{bmatrix}$$

$$h = \text{Max}\begin{bmatrix} 1\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0, 0\wedge_p 0.84, 0\wedge_p 0.45,\ 0\wedge_p 0.09, 0\wedge_p 0, \\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0, 0\wedge_p 0 \end{bmatrix}$$

$$i = \text{Max}\begin{bmatrix} 1\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0, 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0, 0\wedge_p 0, \\ 0\wedge_p 0.84,\ 0\wedge_p 0.27,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0, 0\wedge_p 0 \end{bmatrix}$$

$$j = \text{Max}\begin{bmatrix} 1\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0, 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0.84, \\ 0\wedge_p 0,\ 0\wedge_p 0.84,\ 0\wedge_p 0.45,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0, 0\wedge_p 0 \end{bmatrix}$$

$$k = \text{Max}\begin{bmatrix} 1\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0.84 \\ 0\wedge_p 0.45, 0\wedge_p 0, 0\wedge_p 0.27, 0\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0 \end{bmatrix}$$

$$l = \text{Max}\begin{bmatrix} 1\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0, 0\wedge_p 045 \\ 0\wedge_p 0.09, 0\wedge_p 0.45, 0\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0 \end{bmatrix}$$

$$m = \text{Max}\begin{bmatrix} 1\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0,\ 0\wedge_p 0, 0\wedge_p 0,\ 0\wedge_p 0, \\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0.09,\ 0\wedge_p 0.09, 0\wedge_p 0.45 \end{bmatrix}$$

$$n = \text{Max}\begin{bmatrix} 1\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0,\ 0\wedge_p 0, 0\wedge_p 0,\ 0\wedge_p 0, \\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0,\ 0\wedge_p 0.09,\ 0\wedge_p 0,\ 0\wedge_p 0.45, 0\wedge_p 0.09 \end{bmatrix}$$

$$o = \text{Max}\begin{bmatrix} 1\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0, \\ 0\wedge_p 0, 0\wedge_p 0, 0\wedge_p 0, 0\wedge_p 027, 0\wedge_p 0.09, 0\wedge_p 0.27, 0\wedge_p 0.09 \end{bmatrix}$$

I $*_p$ B= (0, 0.9, 0.77, 0,77, 0.13, 0.25, 0.62, 0.94, 0.06, 0.31, 0.44, 0.81, 0.19, 0.5, 0.56, 0.88)
→ (1,1, 1, 1, 0.13, 0.25, 1, 1, 0.06, 0.31, 0.44, 1, 0.19, 1, 1, 1)= I_1

I_1 $*_p$ B= (0.63,0.9, 0.83, 0.86, 0.86, 0.59. 0.66,0.95, 0.4, 0.62, 0.59, 0.81, 0.55, 0.73, 0.76, 0.91)
→ (1, 1, 1, 1, 1, 1, 1, 1,0.4, 1,1, 1, 1, 1, 1, 1)= I_2

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$I_2 *_p$ B= (0.63,0.9, 0.83, 0.86, 0.86, 0.88. 0.79, 0.99,0.85, 0.89, 0.69, 0.9, 0.56, 0.73, 0.76,0.91)
→ (1,1,1,1,1, 1,1,1, 1,1,1,1,1, 1,1, 1)= I_3

$I_3 *_p$ B= (0.63,0.9, 0.83, 0.86,0.86, 0.88. 0.79, 0.99,0.85, 0.89, 0.91, 0.9, 0.56, 0.73, 0.76,0.91)
→ (1,1,1,1,1, 1,1,1, 1,1,1,1,1, 1,1, 1)= I_4

$I_3 = I_4$

I_4 be the hidden pattern, which is fixed pattern. From the analyses of PCDBFCM, it is understood that when theR_1 is in the on-state position then the other state $R_7, R_{12}, R_{13}R_3, R_5, R_{11}, R_{16}, R_2, R_6, R_8, R_{14}, R_4, R_9, R_{10}, R_{15}$are also in on state.The attributes Loneliness, Physical Illness, Family pressure, Family Status /background, Economic conditions, Social and religious values, High expectations, Adamant character, Frustration, Faithfulness /fidelity, Loss of dear ones /significant other, Child rearing issues, Faultlessness, Misunderstanding Negligence and Lack of tolerance are the problems of role of happiness in the family.

6. Conclusion

This paper proposes the concept of plithogenic combined disjoint block fuzzy cognitive map. With this technique, this research work, while dealing with multi attributes with a contradiction degree, we get accurate results. When applying the PCDFCM, it gets connectivity of disjoint blocks of various disjoint attributes with contraction degree. The further research study may extend its scope in developing the concept into a Plithogenic combined disjoint block in fuzzy numbers and a neutrosophic cognitive map in decision making.

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