ADV MATH SCI JOURNAL
Advances in Mathematics: Scientific Journal **9** (2020), no.12, 11161–11167
ISSN: 1857-8365 (printed); 1857-8438 (electronic)
https://doi.org/10.37418/amsj.9.12.96

RANKING METHOD USING NEW TRIANGULAR COMBINED OVERLAP NEUTROSOPHIC COGNITIVE MAPS (TRCOBNCMS)

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ABSTRACT. In this paper, a new Triangular Combined Overlap Neutrosophic Cognitive Maps is used to find the ranking for the problems of housemaids. This problem involves decision making under uncertain situations. It likewise affects the mood swings of housemaids while at employment. Their feelings are considered a unique number of triangular values and have been scored with such linguistic values as very low, low, medium, high and very high. The solution and concludes with the ranking of the Parameters for the problems of house maids

1. INTRODUCTION

Fuzzy means being not sure. Many real-life situations are complex and fuzzy. These fuzzified situations need to be solved. We come across situations where we do not have proper information to finalize our decision. Fuzzy Sets were introduced by Lotfi A. Zadeh in 1965. It has wide range of application in science, business, management theory, medical diagnosis and so on. This has put a way to bring solutions to problems. This theory has come out in the same way as classical sets. Classical Sets have two solutions while fuzzy sets have solutions with the range from 0 to 1.

The resolution of human choices with tendencies are consistently questionable. The standard strategies for using crisp characteristics are inadequate in various

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2020 *Mathematics Subject Classification.* 03B99, 03E99.

Key words and phrases. Fuzzy cognitive maps, neutrosophic cognitive map, Triangular combined overlap block FCM, housemaids, ranking, triangular number.

authentic conditions. It occurs when the boundary of data which we provide is not clear and imprecise. It provides an inference that represents the same human thinking and reasoning when we approach problems. It is suitable for many uncertain situations which cannot be modelled due to inappropriate information. It allows the decision maker to come out with proper results using unsure information. Fuzzy sets allow gradation such as all answers within 0 to 1. It is a graphical description that expresses how the transition takes place from point to another.

Valuable references are [1-8].

2. PRELIMINARIES

Definition 2.1. *Nodes of the TDr NCM are called as fuzzy nodes if nodes are fuzzy sets*

Definition 2.2. *Simple TDrNCMs are TDrNCM if edge weights or causalities are from the set -1, 0 1.*

Definition 2.3. *An TDrNCM is a directed graph with concepts like policies, events etc, as nodes and causalities as edges, It represents causal relationships between concepts.*

Definition 2.4. *An TDrNCM is said to be cyclic is said to have a feedback.*

Definition 2.5. *When there is a feedback in an TDrNCM, i.e, when the causal relations flow through a cycle in a revolutionary way, the TDrNCM is called a dynamical system.*

Definition 2.6. *If the TDrFCM settles down with a state vector repeating in the form* $A_1 \to A_2 \ldots A_i \to A_1$ *then this equilibrium is called a limit cycle.*

Definition 2.7. *Let* P *be the problem under investigation. Let* $\{{}_{TDr}C_1, {}_{TDr}C_2, \ldots, {}_{TDr}C_n\}$ *be* n *concepts associated with* p *(n very large). Now divide the number of concepts* $\{{}_{HDr}C_1, {}_{HDr}C_2, \ldots, {}_{HDr}C_n\}$ *into classes* $S_1, S_2, \ldots S_t$ *Where classes are such that*

(1) $S_i \cap S_{i+1} \neq \emptyset$ *where* $(i = 1, 2 \ldots t-1)$*;*
(2) $\cup s_i = (c_1, \ldots, c_n)$*;*
(3) $(s_i) \neq s_j$ *if* $i \neq j$ *in general.*

3. MAIN RESULTS

Now we obtain the TDrCOBNCM associated with each of the classes $S_1, S_2, \ldots, S_t$. We determine the relational matrix associated with each S. Using these matrices, we obtain an $n \times n$ matrix. This $n \times n$ matrix is the matrix associated with the Triangular combined overlap block FCM (TDrCOBNCM) of blacks of same sizes.

Using the linguistic questionnaire and the expert's opinion, we have taken the following nine concepts $\{{}_{TDr}C_1, {}_{TDr}C_2, \ldots, {}_{TDr}C_9\}$

${}_{TDr}C_1$ - Paying less salary

${}_{TDr}C_2$ - Ill treatment

${}_{TDr}C_3$ - Treating as a family member

${}_{TDr}C_4$ - Making the housemaids to work for long hours

${}_{TDr}C_5$ - Sexual Abuse

${}_{TDr}C_6$ - Treating with suspicion

${}_{TDr}C_7$ - Being kind, friendly, considerate

${}_{TDr}C_8$ - No fixed time schedule for work

${}_{TDr}C_9$ - Feeling Depressed

Step-1

Linguistic Variables and Linguistic Values for the Triangular Fuzzy Node

TABLE 1.

	${}_{Tr}C_1$	${}_{Tr}C_2$	${}_{Tr}C_5$	${}_{Tr}C_6$
${}_{Tr}C_1$	0	h	m	h
${}_{Tr}C_2$	h	0	IM	hI
${}_{Tr}C_5$	H	h	0	h
${}_{Tr}C_6$	h	h	h	0

TABLE 2.

	${}_{Tr}C_1$	${}_{Tr}C_2$	${}_{Tr}C_5$	${}_{Tr}C_6$
${}_{Tr}C_1$	0	$0.7, 0.9, 1$	$0.3, 0.5, 0.7$	$0.7, 0.9, 1$
${}_{Tr}C_2$	$0.7, 0.9, 1$	0	$0.3, 0.5, 0.7$	$0.5, 0.7, 0.9$
${}_{Tr}C_5$	$0.3, 0.5, 0.7$	$0.7, 0.9, 1$	0	$0.7, 0.9, 1$
${}_{Tr}C_6$	$0.7, 0.9, 1$	$0.5, 0.7, 0.9$	$0.7, 0.9, 1$	0

Step-2

The directed graph and the relational matrix for the class $C = \{C_1, C_2, C_5, C_6\}$. Given by the expert is as follows:

TABLE 3.

	${}_{Tr}C_1$	${}_{Tr}C_2$	${}_{Tr}C_5$	${}_{Tr}C_6$
${}_{Tr}C_1$	0	h	m	h
${}_{Tr}C_2$	h	0	IM	hI
${}_{Tr}C_5$	H	h	0	h
${}_{Tr}C_6$	h	h	h	0

Linguistic values of the triangular fuzzy nodes

TABLE 4.

	${}_{Tr}C_1$	${}_{Tr}C_2$	${}_{Tr}C_5$	${}_{Tr}C_6$
${}_{Tr}C_1$	0	$0.7, 0.9, 1$	$0.3, 0.5, 0.7$	$0.7, 0.9, 1$
${}_{Tr}C_2$	$0.7, 0.9, 1$	0	$0.3, 0.5, 0.7$	$0.5, 0.7, 0.9$
${}_{Tr}C_5$	$0.3, 0.5, 0.7$	$0.7, 0.9, 1$	0	$0.7, 0.9, 1$
${}_{Tr}C_6$	$0.7, 0.9, 1$	$0.5, 0.7, 0.9$	$0.7, 0.9, 1$	0

The directed graph and the relational matrix for the class $C = \{{}_{Tr}C_5, {}_{Tr}C_6, {}_{Tr}C_7, {}_{Tr}C_8\}$. Given by the expert is as follows:

TABLE 5.

	${}_{Tr}C_5$	${}_{Tr}C_6$	${}_{Tr}C_7$	${}_{Tr}C_8$
${}_{Tr}C_5$	0	VH	LI	HI
${}_{Tr}C_6$	H	0	VL	H
${}_{Tr}C_7$	LI	VL	0	IM
${}_{Tr}C_8$	HI	H	IM	0

TABLE 6.

	${}_{Tr}C_5$	${}_{Tr}C_6$	${}_{Tr}C_7$	${}_{Tr}C_8$
${}_{Tr}C_5$	0	$0.7, 0.9, 1$	$0.1, 0.3, 0.5$	$0.5, 0.7, 0.9$
${}_{Tr}C_6$	$0.7, 0.9, 1$	0	$0, 0, 0.1$	$0.7, 0.9, 1$
${}_{Tr}C_7$	$0.1, 0.3, 0.5$	$0, 0, 0.1$	0	$0.5, 0.7, 0.9$
${}_{Tr}C_8$	$0.5, 0.7, 0.9$	$0.7, 0.9, 1$	$0.5, 0.7, 0.9$	0

Continue The Process

The combined direct graph and Triangular combined overlap block FCM (TrCOB-NCM) of equal sizes as follows

TABLE 7.

	${}_{Tr}C_1$	${}_{Tr}C_2$	${}_{Tr}C_3$	${}_{Tr}C_4$	${}_{Tr}C_5$	${}_{Tr}C_6$	${}_{Tr}C_7$	${}_{Tr}C_8$	${}_{Tr}C_9$
${}_{Tr}C_1$	0	$2.1, 2.7, 3$	$0.7, 0.9, 1$	$0.7, 0.9, 1$	$0.3, 0.5, 0.7$	$0.7, 0.9, 1$	$0.7, 0.9, 1$	$0, 0.2, 0.6$	$1.4, 1.8, 2$
${}_{Tr}C_2$	$2.1, 2.7, 3$	0	$0.5, 0.7, 0.9$	$0.7, 0.9, 1$	$0.3, 0.5, 0.7$	$0.5, 0.7, 0.9$	0	$0.7, 0.9, 1$	$0.7, 0.9, 1$
${}_{Tr}C_3$	$0.7, 0.9, 1$	$0.5, 0.7, 0.9$	0	$0.3, 0.5, 0.7$	0	0	0	0	0
${}_{Tr}C_4$	$0.7, 0.9, 1$	$0.7, 0.9, 1$	$0.3, 0.5, 0.7$	0	0	0	0	0	0
${}_{Tr}C_5$	$0.7, 0.9, 1$	$0.7, 0.9, 1$	0	0	0	$1.4, 1.8, 2$	$0.1, 0.3, 0.5$	$0.5, 0.7, 0.9$	0
${}_{Tr}C_6$	$0.7, 0.9, 1$	$0.5, 0.7, 0.9$	0	0	$1.4, 1.8, 2$	0	$0, 0, 0.1$	$0.7, 0.9, 1$	0
${}_{Tr}C_7$	$0.7, 0.9, 1$	0	0	0	$0.1, 0.3, 0.5$	$0, 0, 0.1$	0	$1, 1.4, 1.8$	$0.7, 0.9, 1$
${}_{Tr}C_8$	$0, 0.2, 0.6$	$0.7, 0.9, 1$	0	0	$0.5, 0.7, 0.9$	$0.7, 0.9, 1$	$1, 1.4, 1.8$	0	$1.4, 1.8, 2$
${}_{Tr}C_9$	$1.4, 1.8, 2$	$0.7, 0.9, 1$	0	0	0	0	$0.7, 0.9, 1$	$1.4, 1.8, 2$	0

Attribute ${}_{Tr}C_1$ is ON:

$A^{(1)} = (1 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0)$

$A^{(1)}Tr(M)_{Weight} = (0, (2.1, 2.7, 3), (0.7, 0.9, 1), (0.7, 0.9, 1), (0.6, 1, 1.4), (0.7, 0.9, 1), (0.7, 0.9, 1), (0, 0.2, 0.6), (1.4, 1.8, 2))$

$A^{(1)}Tr(M)_{Average} = (0, 7.8, 2.6, 2.6, 3, 2.6, 2.6, 0.8, 5.2)$

$A^{(1)}Tr(M)_{Max(Weight)}(010000000) = A_1^{(1)}$

$A^{(1)}Tr(M)_{Average} = (60.84, 0, 16.38, 20.28, 11.7, 16.38, 0, 20.28, 20.28)$

$A^{(1)}Tr(M)_{Max(Weight)} \to (1 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0 \quad 0) = A_2^{(1)} = A^{(1)}$

Do The Process Until Fixed Point

Weightage of the attributes

TABLE 8.

	$_{Tr}C_1$	$_{Tr}C_2$	$_{Tr}C_3$	$_{Tr}C_4$	$_{Tr}C_5$	$_{Tr}C_6$	$_{Tr}C_7$	$_{Tr}C_8$	$_{Tr}C_9$
$_{Tr}C_1$	60.84	0	16.38	20.28	11.7	16.38	0	20.28	20.28
$_{Tr}C_2$	0	60.84	20.28	20.28	23.4	20.28	20.28	6.24	40.56
$_{Tr}C_3$	158.1	0	42.42	52.52	30.3	42.42	0	52.52	52.52
$_{Tr}C_4$	11.70	20.28	20.28	12.22	13.52	12.22	8.76	8.84	13.32
$_{Tr}C_5$	13.53	10.92	0	0	27.04	0	0.52	13.52	0
$_{Tr}C_6$	15.6	13.52	0	0	0	27.04	4.68	10.92	0
$_{Tr}C_7$	3.36	10.92	0	0	8.82	10.92	21.84	0	3.36
$_{Tr}C_8$	10.92	0	0	0	3.78	0.42	0	17.64	10.92
$_{Tr}C_9$	0	21.84	10.92	10.92	12.6	10.92	10.92	3.36	21.84

TABLE 9.

Total Weight	274.05	138.32	110.2	116.2	131.1	140.6	67	133.3	162.8
Average total weight	30.45	15.36	12.2	12.91	14.57	15.6	7.44	14.8	18.1

4. CONCULSION

A new fuzzy model Triangular Combined overlap Neutrosophic Cognitive Maps (TrCOBNCMs) gives the ranking for the Problems of House Maids, paying less salary -30.45, Feeling Depressed -18.1 – Treating with suspicion -15.6, Illtreatment -15.3, No fixed time schedule for work -14.8, Sexual Abuse -14.5, Making the housemaids to work for long hours -12.91, - Treating as a family member -12.2, Being kind, friendly, considerate-7.44

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