

INVESTIGATION OF EFFECT OF TAKING ALCOHOL ON HUMAN BODY
USING COMBINED DISJOINT BLOCK FUZZY COGNITIVE MAPS (CDBFCM)

G. ANUSHA*¹, Dr. NIMMALA SRINIVASARAO²

¹Research Scholar, ²Research Supervisor, Rayalaseema University, Kurnool, India.

(Received On: 18-07-17; Revised & Accepted On: 07-08-17)

ABSTRACT

When a person drinks alcohol, it's absorbed into the bloodstream and affects every part of the body. In the long term, this can put the person's health at serious risk. . In this paper the major effects of taking alcohol on human body is analyzed using Combined Disjoint Block Fuzzy Cognitive Maps (CDBFCM). This method is introduced by W.B. Vasantha Kandasamy and A. Victor Devadoss is analyzed in this paper. The Combined Disjoint Block FCM is defined in this method becomes effective when the number of concepts can be grouped and are large in number. In this paper we analyzed the problems and find out the major effects of smoking on human body using neutrosophic tool. This paper has five sections. First section gives the information about the development of Fuzzy Cognitive Maps and about the effects of taking alcohol on human body. Second section gives the preliminaries of Fuzzy Cognitive Maps and Combined Disjoint Block Fuzzy Cognitive Maps. In section three we explain the method of determining the hidden pattern. In the fourth section, we give the concepts of problem. Final section gives the conclusion based on our study.

Key words— Combined disjoint Fuzzy Cognitive Maps, taking alcohol, human body.

1 INTRODUCTION

In 1965 L.A. Zadeh has introduced a mathematical model called Fuzzy Cognitive Maps. After a decade in the year 1976, Political scientist R.Axelord used this Fuzzy model to study decision making in social and political systems. Then B.Kosko enhanced the power of cognitive maps considering fuzzy values for the concepts of the cognitive maps and fuzzy degrees of interrelationships between concepts. FCMS can successfully represent knowledge and human experience, introduced concepts to represent the essential elements and the cause and effect relationships among the concepts to model the behaviour of any system. It is a very convenient simple and powerful tool, which is used in numerous fields such as social, economical, Medical etc. No matter how one can take alcohol it is dangerous to health and affects entire body. Taking alcohol is enormously harmful to health. In this paper, various effects of taking alcohol on human body are discussed and finally the major effects are identified. Many people enjoy a drink without any problems, but binge drinking or drinking heavily over longer periods of time can have very serious consequences. Alcohol misuse not only harms the individual, but damages relationships and society in general in terms of violence and crime, accidents and drink driving. As well as the recognised immediate effects of drinking too much, such as nausea and vomiting, binge drinking and prolonged heavy drinking over longer periods of time can affect human body in many different ways. It effects

- Nervous System
- Immune System
- Respiratory system
- Cardiovascular system
- Digestive system

In this paper, various effects of taking alcohol on human body are discussed and finally the major effects are identified.

Corresponding Author: G. Anusha*¹,
¹Research Scholar, Rayalaseema University, Kurnool, India.

2. PRELIMINARIES

Fuzzy Cognitive Maps (FCMs) are more applicable when the data in the first place is an unsupervised one. The FCMs work on the opinion of experts. FCMs model the world as a collection of classes and casual relations between classes.

2.1 Definition: When the nodes of the FCM are fuzzy sets then they are called fuzzy nodes.

2.2 Definition: FCMs with edge weights or casualities from the set $\{-1, 0, 1\}$ are called simple FCMs.

2.3 Definition: An FCMs is a directed graph with concepts like policies, events etc, as nodes and casualities as edges. It represents casual relationships between concepts.

2.4 Definition: Consider the nodes/concepts C_1, C_2, \dots, C_n of the FCM. Sup-pose the directed graph is drawn using edge weight $e_{ij} \in \{-1, 0, 1\}$. The matrix E be defined by $E = (e_{ij})$ where e_{ij} is the weight of the directed edge $C_i C_j$. E is called the adjacency matrix of FCM, also known as the connection matrix of the FCM.

It is important to note that all matrices associated with an FCM are always square matrices with diagonal entries as zero.

2.5 Definition: Let C_1, C_2, \dots, C_n be the nodes of an FCM. $A = (a_1, a_2, \dots, a_n)$ where $e_{ij} \in \{-1, 0, 1\}$. A is called the instantaneous state vector and it denotes the on-off position of the node at an instant. $a_i = 0$ if a_i is off and $a_i = 1$ if a_i is on for $i = 1, 2, \dots, n$.

2.6 Definition: Let C_1, C_2, \dots, C_n be the nodes of an FCM. Let $\overline{C_1 C_2}, \overline{C_2 C_3}, \overline{C_3 C_4}, \dots, \overline{C_i C_j}$ be the edges of the FCM($i \neq j$). Then the edges form a directed cycle. An FCM is said to be cyclic if it possesses a directed cycle. An FCM is said to be acyclic if it does not possesses any directed cycle.

2.7 Definition: An FCM is said to be cyclic is said to have a feedback.

2.8 Definition: When there is a feedback in an FCM, i.e, when the casual relations flow through a cycle in a revolutionary way, the FCM is called a dynamical system.

2.9 Definition: Let $\overline{C_1 C_2}, \overline{C_2 C_3}, \overline{C_3 C_4}, \dots, \overline{C_{n-1} C_n}$ be a cycle. When C_i is switched on and if the causality flows through the edges of a cycle and if it again causes C_i , we say that the dynamical system goes round and round. This is true for any node C_i for $i = 1, 2, \dots, n$. The equilibrium state for this dynamical system is called the hidden pattern.

2.10 Definition: If the equilibrium state of a dynamical system is a unique state vector, then it is called a fixed point. Consider an FCM with $\{C_1, C_2, \dots, C_n\}$ as nodes. For example let us start the dynamical system by switching on C_1 . Let us assume that the FCM settles down with C_1 and C_n on i.e., in the state vector remains as $(1, 0, 0, \dots, 0)$ is called fixed point.

2.11 Definition: If the FCM settles down with a state vector repeating in the form $A_1 \rightarrow A_2 \rightarrow \dots \rightarrow A_i \rightarrow A_1$ then this equilibrium is called a limit cycle.

2.12 Definition: Finite number of FCMs can be combined together to produce the point effect of all the FCMs. Let E_1, E_2, \dots, E_p be the adjacency matrices of the FCMs with nodes C_1, C_2, \dots, C_n then the combined FCM is got by adding all the adjacency matrices E_1, E_2, \dots, E_p . We denote the combined FCM adjacency matrix by $E = E_1 + E_2 + \dots + E_p$.

2.13 Definition: Let C_1, C_2, \dots, C_n be n distinct attributes of a problem n very large and a non prime. If we divide n in to k equal classes i.e., $k/n = t$ which are disjoint and if we find the directed graph of each of these k classes of attributes with t attributes each, then their corresponding connection matrices are formed and these connection matrices are joined as blocks to form a $n \times n$ matrix. This $n \times n$ connection matrix forms the combined disjoint block FCM of unequal classes/size.

2.14 Definition: Suppose $A = (a_1, a_2, \dots, a_n)$ is a vector which is passed in to a dynamical system E. Then $AE = (a'_1, a'_2, \dots, a'_n)$ after thresholding and updating the vector suppose we get (b_1, b_2, \dots, b_n) , we denote that by $(a'_1, a'_2, \dots, a'_n) \uparrow (b_1, b_2, \dots, b_n)$. Thus the symbol \uparrow means the resultant vector has been thresholded and updated. FCMs have several advantages as well as some disadvantages. The main advantage of this method is simple. It functions on expert's opinion. When the data happens to be an unsupervised one the FCM becomes handy. This is the only known fuzzy technique that gives the hidden pattern of the situation. As we have a very well known theory, which states that

the strength of the data depends on ,the number of experts opinions. At the same time the disadvantages of the combined FCM is when the weightages are 1 and -1 for the same $C_i C_j$, we have the sum adding to zero, thus at all times the connection matrices E_1, E_2, \dots, E_k may not be conformable for addition. Combined conflicting opinions tend to cancel out and assisted by the strong law of large numbers, a consensus emerges as the sample opinion approximates the underlying population opinion. This problem will be easily overcome if the FCM entries are only 0 and 1.

3. METHOD OF DETERMINING THE HIDDEN PATTERN

Let C_1, C_2, \dots, C_n be the nodes of an FCM, with feedback. Let E be the associated adjacency matrix. Let us find the hidden pattern when C_1 is switched on. When an input is given as the vector $A_1 = (1, 0, \dots, 0)$, the data should pass through the relation matrix E. This is done by multiplying A_1 by the matrix E. Let $A_1 E = (a_1, a_2, \dots, a_n)$ with the threshold operation that is by replacing a_i by 1 if $a_i \geq k$ and a_i by 0 if $a_i < k$ (k is a suitable positive integer). We update the resulting concept; the concept C_1 is included in the updated vector by making the first coordinate as 1 in the resulting vector. Suppose $A_1 E \supseteq A_2$ then consider $A_2 E$ and repeat the same procedure. This procedure is repeated till we get a limit cycle or a fixed point.

4. CONCEPTS OF THE PROBLEM

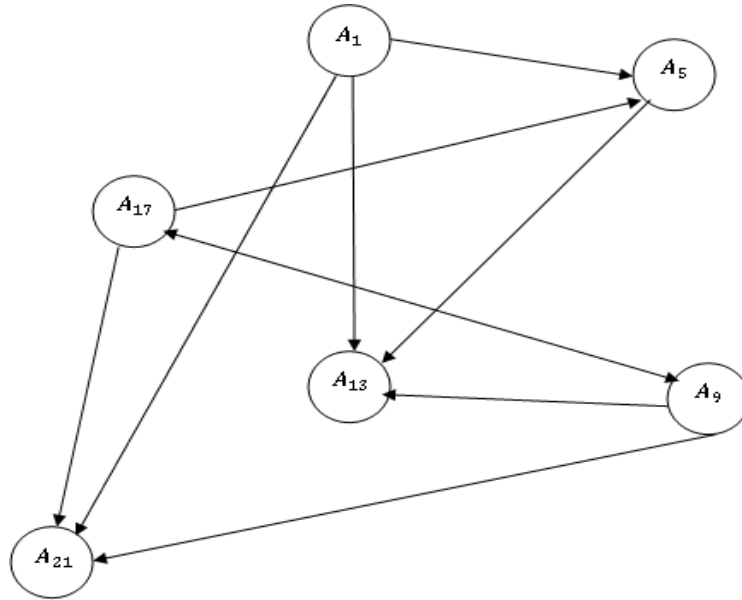
Using the linguistic questionnaire and the expert's opinion we have taken the following twenty four attributes $\{A_1, A_2, \dots, A_{24}\}$.

- A_1 – Cardiomyopathy
- A_2 - Fatty Liver
- A_3 - Poor Nutrition
- A_4 – Drastic Mood Swings
- A_5 – Irregular heart beat
- A_6 - Alcoholic Hepatitis
- A_7 – Anaemia
- A_8 – Becoming Angry
- A_9 - High blood pressure
- A_{10} - Fibrosis
- A_{11} – Weakened immune system
- A_{12} - Anxiety and depression
- A_{13} - Stroke
- A_{14} - Cirrhosis
- A_{15} – Cancer
- A_{16} – Getting in to trouble with the police
- A_{17} - Heart attack
- A_{18} - Liver failure
- A_{19} – Stomach distress
- A_{20} – Having accidents or arguments
- A_{21} - Heart failure
- A_{22} - Liver cancer
- A_{23} – Gastro intestinal inflammation
- A_{24} - Family relationships affected

These 24 attributes are divided into 4 classes C_1, C_2, C_3, C_4 with 6 in each class.

$$\begin{aligned} \text{Let } C_1 &= \{A_1, A_5, A_9, A_{13}, A_{17}, A_{21}\} \\ C_2 &= \{A_2, A_6, A_{10}, A_{14}, A_{18}, A_{22}\} \\ C_3 &= \{A_3, A_7, A_{11}, A_{15}, A_{19}, A_{23}\} \\ C_4 &= \{A_4, A_8, A_{12}, A_{16}, A_{20}, A_{24}\} \end{aligned}$$

Now we take the expert opinion for each of these classes and take the matrix associated with the combined disjoint block FCMs. The experts opinion for the class $C_1 = \{A_1, A_5, A_9, A_{13}, A_{17}, A_{21}\}$ is in the form of the directed graph.

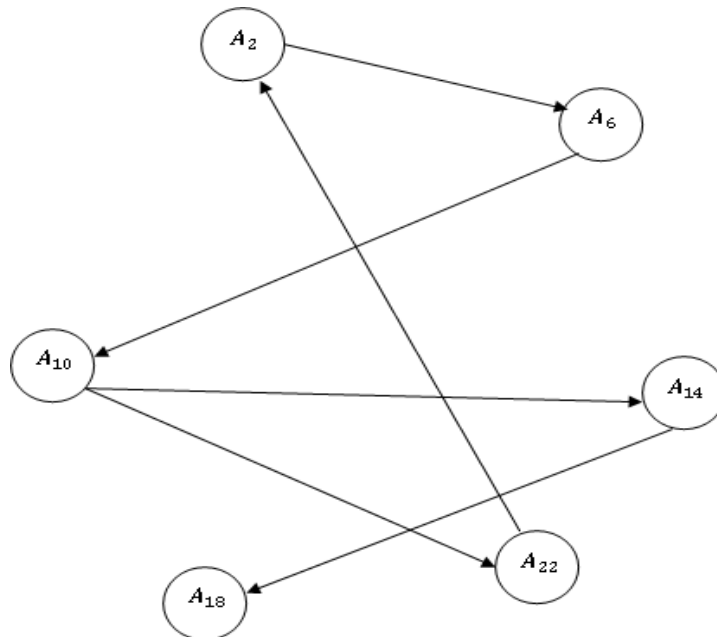


According to this expert the attribute Cardiomyopathy is the reason for irregular heart beat, stroke, Heart failure. The attribute High blood pressure is the reason for stroke, heart attack, heart failure. Due to stroke there is irregular heart beat, high blood pressure.

The related connection matrix M_1 is given below

$$M_1 = \begin{bmatrix} 0 & 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

The experts opinion for the class $C_2 = \{A_2, A_6, A_{10}, A_{14}, A_{18}, A_{22}\}$ is in the form of the directed graph.

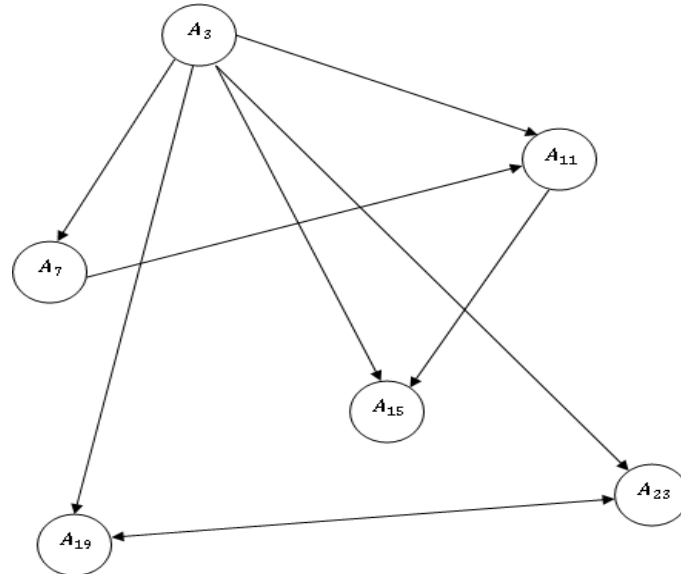


According to this expert the attribute Fatty liver is the reason for Alcoholic hepatitis. The attribute Alcoholic hepatitis is the reason for Fibrosis. The attribute Fibrosis is the reason for Cirrhosis, Liver cancer. The attribute Cirrhosis is the reason for Liver failure. The attribute Liver cancer is the reason for Fatty liver.

The related connection matrix is M_2 given below.

$$M_2 = \begin{bmatrix} 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

The experts opinion for the class $C_3 = \{A_3, A_7, A_{11}, A_{15}, A_{19}, A_{23}\}$ is in the form of the directed graph.

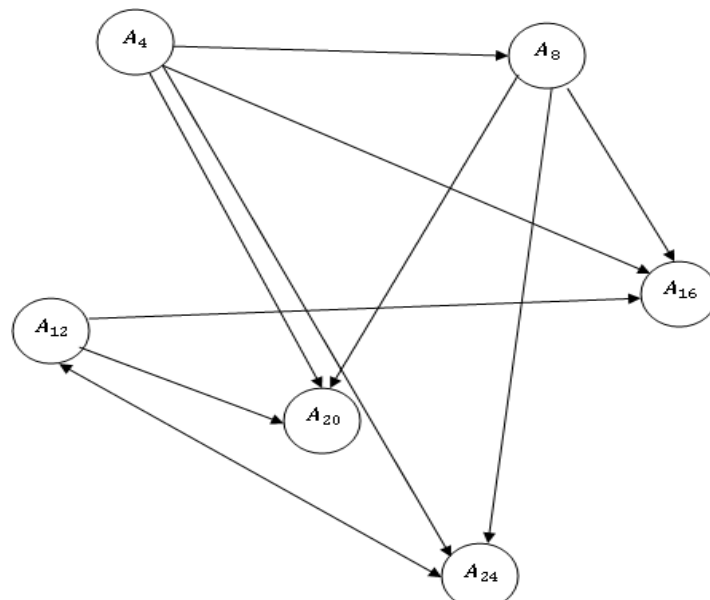


According to this expert the attribute Poor nutrition is the reason for Anaemia, weakening of immune system, Cancer, Stomach distress, Gastrointestinal inflammation. The attribute Anaemia is the reason for weakening of immune system. The attribute weakening of immune system is the reason for Cancer. The attribute Stomach distress is interrelated with Gastrointestinal inflammation.

The related connection matrix is M_3 given below.

$$M_3 = \begin{bmatrix} 0 & 1 & 1 & 1 & 1 & 1 \\ 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 & 0 \end{bmatrix}$$

The experts opinion for the class $C_4 = \{A_4, A_8, A_{12}, A_{16}, A_{20}, A_{24}\}$ is in the form of the directed graph.



According to this expert the attribute Drastic mood swings is the reason for becoming angry, getting in to trouble with the police, having accidents or arguments, family relationships affected. The attribute becoming angry is the reason for, getting in to trouble with the police, having accidents or arguments, family relationships affected. The attribute anxiety and depression is the reason for getting in to trouble with the police, having accidents or arguments, family relationships affected. The attributes anxiety and depression and family relationships affected are interrelated.

The related connection matrix is M_4 given below.

$$M_4 = \begin{bmatrix} 0 & 1 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \end{bmatrix}$$

Now the combined disjoint block connection matrix of the fuzzy cognitive maps F is given by

$$F = \begin{bmatrix} 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 \\ 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

Suppose we consider the on state of the attribute cardiomyopathy and all other states are off the effect of $Y = (1 \ 0)$ on the CDBFCM is given by

$$YF_1 \ (0 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0) = Y_1 \text{ (Say)}$$

$$Y_1F_1 \ (0 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0) = Y_2 \text{ (Say)}$$

$$Y_2F_1 \ (0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0) = Y_3 \text{ (Say)}$$

$$Y_3F_1 \ (0 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0) = Y_4 = Y_2$$

Y_2 is a fixed point of the dynamical system. When the state A_1 is on irregular heart beat, high blood pressure effects human body. Suppose we consider the on state of the attributes cardiomyopathy, fatty liver, drastic mood swings, weakening of immune system and all other nodes are in off state. Now we study the effect of the dynamical system F

Let $T = (1 \ 1 \ 0 \ 1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0)$ be the state vector depicting the on state vector T in to the dynamical system F.

$$TF_7 (0 \ 0 \ 0 \ 0 \ 1 \ 1 \ 0 \ 1 \ 0 \ 0 \ 0 \ 0 \ 1 \ 0 \ 1 \ 1 \ 0 \ 0 \ 0 \ 1 \ 1 \ 0 \ 0 \ 1) = T_1$$

(Say)

$$T_1F_7 (0 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 1 \ 1 \ 0 \ 1 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 1) = T_2$$

(Say)

$$T_2F_7 (0 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 1 \ 1 \ 1 \ 0 \ 1 \ 1 \ 0 \ 0 \ 1 \ 1 \ 0 \ 0 \ 1) = T_3$$

(Say)

$$T_3F_7 (0 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 1 \ 1 \ 0 \ 0 \ 1 \ 1 \ 1 \ 0 \ 1 \ 1 \ 0 \ 0 \ 1) = T_4$$

(Say)

$$T_4F_7 (0 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 1 \ 1 \ 0 \ 0 \ 1 \ 1 \ 0 \ 0 \ 1 \ 1 \ 1 \ 0 \ 1) = T_5$$

(Say)

$$T_5F_7 (0 \ 1 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 1 \ 1 \ 0 \ 0 \ 1 \ 1 \ 0 \ 0 \ 1 \ 1 \ 0 \ 0 \ 1) = T_6$$

(Say)

$$T_6F_7 (0 \ 0 \ 0 \ 0 \ 1 \ 1 \ 0 \ 0 \ 1 \ 0 \ 0 \ 1 \ 1 \ 0 \ 0 \ 1 \ 1 \ 0 \ 0 \ 1 \ 1 \ 0 \ 0 \ 1) = T_7$$

(Say)

$$T_7F_7 (0 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 1 \ 1 \ 0 \ 1 \ 1 \ 0 \ 0 \ 1 \ 1 \ 0 \ 0 \ 1 \ 1 \ 0 \ 0 \ 1) = T_8$$

(Say)

$$T_8F_7 (0 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 1 \ 1 \ 1 \ 0 \ 1 \ 1 \ 0 \ 0 \ 1 \ 1 \ 0 \ 0 \ 1) = T_9$$

= T_3

Then T_3 is a fixed point of the dynamical system. Thus the attributes A_1, A_2, A_4, A_{11} are in the on states and the attributes Poor Nutrition, Irregular heartbeat, Alcoholic Hepatitis, Anaemia, Becoming Angry, High blood pressure, Fibrosis, Anxiety and depression, Stroke, Cirrhosis, Cancer, Getting in to trouble with the police, Heart attack, Liver failure, Stomach distress, Having accidents or arguments, Heart failure, Liver cancer, Gastro intestinal inflammation, Family relationships affected are in the off state all other states become on.

5. CONCLUSION

We investigated the effects of taking alcohol on human body using CDBFCM model. The limit point of the dynamical system reveals that the attributes $A_5, A_9, A_{12}, A_{13}, A_{14}, A_{16}, A_{17}, A_{20}, A_{21}, A_{24}$ are the main effects of taking alcohol on human body. This means Irregular heartbeat, High blood pressure, Anxiety and depression, Stroke, Cirrhosis, Getting in to trouble with the police, heart attack, Having accidents or arguments, Heart failure, Family relationships affected are the main effects of taking alcohol on human body and because of these their health is getting effected.

REFERENCES

1. A. Victor Devadoss, M. Clement Joe Anand, A. Felix, "A Study on the Impact of Violent Video-Games playing among Children in Chennai using Neutrosophic Cognitive Maps (NCMs)", *International Journal of Scientific & Engineering Research*, Volume 3, Issue 8, August-2012.
2. A. Victor Devadoss, M. Clement Joe An and, "Dimensions of Personality of Women in Chennai Using CETD Matrix", *International Journal of Computer Applications*, July-2012.
3. B. Kosko, "Hidden patterns in combined and Adaptive Knowledge Networks", Proc. Of the First, *IEE International Conference on Neural Networks (ICNN-86(1988) 377-393)*.
4. B. Kosko, "Neural Networks and Fuzzy systems: A Dynamical System Approach to Machine Intelligence", Prentice Hall of India, 1997.
5. George J. Klir/Bo Yuan, "Fuzzy sets and Fuzzy Logic: Theory and Applications", Prentice Hall of India.
6. H. J. Zimmermann, "Fuzzy Set Theory and its application", Fourth Edition Springer 2011.
7. Programme evaluatin report: Activity Based Learning Tamil Nadu, National council of educational research and training, December 2011.
8. R. Axelrod, "Structure of decision: The cognitive maps of political elites". Princeton, N.J: Princeton University Press, 1976.

9. W. B. Vasantha Kandasamy and Smarandache Florentin, "Analysis of social aspects of migrant labours living with HIV/AIDS using Fuzzy Theory and Neutrosophic Cognitive Maps, Xi-quan, Phoenix (2004)
10. W. B. Vasantha Kandasamy and A. Victor Devadoss, "Some New Fuzzy Techniques", Jour. of Inst. of Math. & Comp. Sci. (Math.Ser.), Vol. 17, No.2, (2004), 157- 160
11. Chapman, H.D and Pratt. P.F. 1961. Methods of analysis of Soils, Plants and Waters, University of California.
12. VCCI 1990. National Curriculum Council, Environmental Education 7 (Seven) Curriculum guidance book ISBN-18772676251 NCC, Albion, Wharf .25.SK Eldergate, yorky012xl.
13. J. D Collins 1980, Mathematics and Environmental Education ed. World wild life fund (WWF) for nature.
14. NCERT 2005, National Curriculum Frame work, NCERT edition, Aurobindo Marg, New Delhi.
15. Ramachandra T. V., Rajasekhar Murthy. C and Ahalya. N 2002. Restoration of Lakes and Wetlands, Allied Publishers (P) limited.

Source of support: Nil, Conflict of interest: None Declared.

[Copy right © 2017. This is an Open Access article distributed under the terms of the International Journal of Mathematical Archive (IJMA), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.]