A STUDY ON THE IMPACT OF MEDIA ON ADOLESCENTS USING COMBINED FUZZY COGNITIVE MAPS (CFCMS) MODEL

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Abstract: The Adolescent period acts as the crucial period when the behaviour of an individual should be taken under care for, the influence of media affects a lot from their development. This paper analyses the impact of media among the adolescent using Combined Fuzzy Cognitive Map model .this paper consists of four sections. Section one is introductory in nature that deals with the influence of media among the adolescents.Section two deals with the description of Combined FCM. Section three gives the study and analysis of the problem. Section four gives the conclusion and suggestion based on the study.

Keywords: CFCMs, Hidden pattern, fixed point, Adolescents, social media.

Introduction: The handling of media and its impact on the individual during the Adolescent age modifies the behaviour of the person from good to bad or vice versa. The pleasure that they receive temporarily matters more than the permanent fruit that they seek. Due to the influence of media the adolescents are affected in various ways.Mental stress, sleep deprivation, addiction to drugs, distraction from studies, wastage of money and time, weakness in health, Brain tumor, sexual urge etc take place. Peer group pressure coupled with distraction from media make the adolescents to behave in a deviant way unlike the normal children. Looking the other way if medias are properly used, students at the adolescent period have a lot to benefit. Learning through online is a quick and efficient method. Through internet, one can get any information just at the touch of the button. This paper aims at drawing the negative impact of media among the adolescents using Combined FCM model.

2. Fuzzy Cognitive Map (FCM): 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 map 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 behavior of any system. It is a very convenient simple and powerful tool, which is used in numerous fields such as social, economical, educational, medical etc. illustrated by W.B.VasanthaKandasamy in her book, "Application of Fuzzy Models in Social Sciences". In thispaper we recall the notion of Fuzzy Cognitive Maps (FCMs), which was introduced by Bart Kosko in the year 1986.This work is based on expert opinion collected throughout Chennai by administering a questinaire on adolescent students, their parents and teachers. Their responses were transformed into fuzzy data. It is important to notethat, while doing fuzzy mathematical models, the fuzzy matrix take its entries from the interval [-1.1]. They are known as fuzzy matrices. Therefore, it is understood that Fuzzy tools alone have the capacity to analyze these concepts further substantiating the choice of this method

2.1 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 worlds as a collection of classes and causal relation between classes.

Definition 2.1.1: An FCM is a directed graph with concepts like policies, events etc as nodes and causalities as edges. It represents causal relationship between concepts.

Definition 2.1.2: When the nodes of the FCM are fuzzy sets then they are called as fuzzy nodes.

Definition 2.1.3: FCMs with edge weights or causalities from the set {-1, 0, 1} are simple FCMs.

Definition 2.1.4: The edges e_{ij} take values in the fuzzy causal interval [-1,1]. e_{ij} = 0 indicates no causality,e_{ij}> 0 indicates causal increase C_j increases as C_i increases (Or C_j Decreases as C_i Decreases). e_{ij}< 0 indicates causal decrease or negative causality. C_j decreases as C_i increases (and or C_j increases as C_i decreases). Simple FCMs have edge values in {-1, 0, 1}. Then if causality occurs, it occurs to a maximal positive or negative degree. Simple FCMs provide a quick first approximation to an expert stand or printed causal knowledge. If increase (Or decrease) in one concept leads to increase (or decrease) in another, then we give the value 1.If there existsnorelation between the two concepts, the value 0 is given. If increase (or decrease) in one concept decreases (or increases) another, then we gives the value -1. Thus, FCMs are described in this way. Consider the nodes or concepts C_1, ...,C_n of the FCM.

Suppose the directed graph is drawn using edge weight $e_{ij} \in \{0, 1, -1\}$. The matrix E be defined by $E = (e_{ij})$, where the e_{ij} is the weight of the directed edge C_iC_j. E is called the adjacency matrix of the 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.

Definition 2.1.5: Let $C_1, C_2, \ldots C_n$ be the nodes of an FCM. Let $A=(a_1, a_2, \ldots, a_n)$, where $a_i \in \{0,1\}$. A is called the instantaneous state vector and it denoted 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, where i = 1, 2, ..., n. → → →

Definition 2.1.6: Let $C_1, C_2, \ldots, C_n$ be the nodes of an FCM. Let $C_1C_2, C_2C_3, \ldots, C_iC_j$, 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 possess any directed cycle.

Definition 2.1.7: An FCM with cycles is said to have a feedback.

Definition 2.1.8: Where there is a feedback in an FCM, i.e., When the causal relations flow through a cycle in a revolutionary way, The FCM is called a dynamical system. → → →

Definition 2.1.9: Let $C_1C_2, C_2C_3, \ldots, C_iC_j$, 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, ..., n. The equilibrium state for this dynamical system is called the hidden pattern.

Definition 2.1.10: If the equilibrium state of a dynamical system is a unique state vector, then it is called a fixed point. Consider a FCM with $C_1, C_2, \ldots, C_n$ 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. the state vector remains as (1, 0, 0,..., 0, 1) this state vector (1, 0, 0, ..., 0, 1) is called the fixed point.

Definition 2.1.11: If the FCM settles down with a state vector repeating in the form $A_1 \rightarrow A_2 \rightarrow \ldots A_I \rightarrow A_1$. Then this equilibrium is called limit cycle.

Definition 2.1.12: Finitenumber of FCMs can be combinedtogether toproducethejointeffectofallthe FCMs. Let $E_1, E_2, \ldots, E_p$ beadjacency matrices of theFCMs withnodes$C_1, C_2, \ldots, C_n$, thenthe combinedFCM[5,6,7]isgot by addingalltheadjacency matrices$E_1, \ldots, E_p$. Wedenotethecombined FCMadjacency matrixby$E = E_1 + E_2 + \ldots + E_p$

2.1.13: METHOD OF DETERMINING HIDDEN PATTERN: Let $C_1, C_2, \ldots, C_n$ be the nodes of an FCM, The matrix associated with the above graph is

C1 C2 C3 C4 C5 C6 C7 C8 C9

with feedback. Let E be the associated adjacency matrix. Let us find the hidden pattern when $C_6$is switched on. When an input is given as the vector $A_1 = (1, 0, 0, \ldots, 0)$, the data should pass through the relation matrix E. this is done by multiplying A_1 by the matrix E. Let $A_1 E = (a_1, \ldots, a_n)$with the threshold operation that is by replacing $a_i$by 1 if $a_i > k$ and a_i by 0 if $a_i < k$ (k is a suitable positive integer). We update the resulting concept. The concept C_6 is included in the updated vector by making the sixth coordinate as 1 in the resulting vector. Suppose $A_1 E \rightarrow A_2$ then consider A_2E and repeat the same procedure. This procedure is repeated till we get a limit cycle or a fixed point.

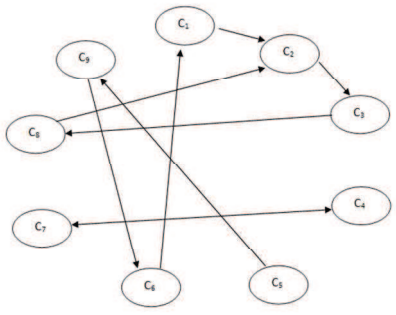
3. Analysis of the impact of media on theAdolescents using CombinedFuzzy Cognitive Maps(CFCMs)

3.1 The main nodes that portrays as the impact of media on the Adoloscents: By administering linguistic questionnaire and the expert's opinion we have taken the following nine concepts $\{C_1, C_2, \ldots, C_9\}$

C_1- Sleep deprivation
C_2- Mental stress
C_3- Brain tumour
C_4-Addiction to drugs
C_5- Distraction
C_6- Sexual satisfaction
C_7-Wastage of money
C_8- Health hazard
C_9- Wastage of time

3.3 ANALYSIS OF THE PROBLEM: Now we proceed on to analyze the problems using CFCM. Let us consider the ten concepts $\{C_1, C_2, \ldots, C_9\}$

A. **Expert's opinion based on Teacher's view:** The results listed above were collected from the expert's opinion and the following diagram summaries their inter-relationship according the opinion expressed by teachers.



The matrix associated with above graph is

$$A = \begin{array}{c} \\ C1 \\ C2 \\ C3 \\ C4 \\ C5 \\ C6 \\ C7 \\ C8 \\ C9 \end{array} \begin{array}{c} \begin{array}{ccccccccc} C1 & C2 & C3 & C4 & C5 & C6 & C7 & C8 & C9 \end{array} \\ \begin{bmatrix} 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \end{bmatrix} \end{array}$$

Matrix A is the adjacency matrix or connection Matrix of the Fuzzy Cognitive Map .Let us consider the state vector Xo where the concept C_4 is in the on state and other nodes are in the off sate.

That is, the initial input vector be

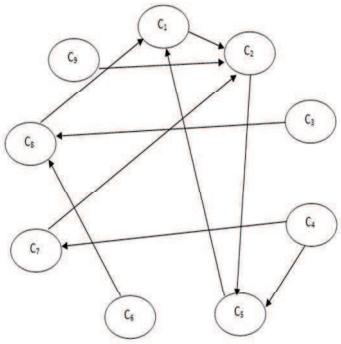
$X_o = \{ 0\ 0\ 0\ 1\ 0\ 0\ 0\ 0\ 0 \}$

$X_o A \rightarrow \{0\ 0\ 0\ 1\ 0\ 0\ 1\ 0\ 0\} = X_1$

$X_1 A \rightarrow \{0\ 0\ 0\ 1\ 0\ 0\ 1\ 0\ 0\} = X_2 = X_1$

When C_4 (Addiction to drugs) is in "on state", C_7 (wastage of money) comes up 'on state' which is self explanatory.

B. Expert's opinion based on Student's view: The following diagram summarises the inter-relationship of the aove nodes according the opinion expressed by student:



The matrix associated with the above graph is

$$B = \begin{array}{c} \\ C1 \\ C2 \\ C3 \\ C4 \\ C5 \\ C6 \\ C7 \\ C8 \\ C9 \end{array} \begin{array}{c} \begin{array}{ccccccccc} C1 & C2 & C3 & C4 & C5 & C6 & C7 & C8 & C9 \end{array} \\ \begin{bmatrix} 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \end{array}$$

The concept C_4 is in the on state and other nodes are in the off sate.

Let the initial input vector be

$X_o = \{ 0\ 0\ 0\ 1\ 0\ 0\ 0\ 0\ 0 \}$.

$X_o A \rightarrow \{0\ 0\ 0\ 1\ 1\ 0\ 1\ 0\ 0\} = X_1$

$X_1 A \rightarrow \{1\ 1\ 0\ 1\ 1\ 0\ 1\ 0\ 0\} = X_2$

$X_2 A \rightarrow \{1\ 1\ 0\ 1\ 1\ 0\ 1\ 0\ 0\} = X_3 = X_2$

When C_4 (Addiction to drugs) is in "on state", C_1 (Sleep deprivation),C_2 (mental stress),C_5 (distraction) and C_7 (wastage of money) comes up 'on state'.

C. Expert's opinion based on Parent's view: The results listed above were collected from the expert's opinion and the following diagram summaries their inter-relationship according the opinion expressed by parents.The matrix associated with the above graph is

$$C = \begin{array}{c} \\ C1 \\ C2 \\ C3 \\ C4 \\ C5 \\ C6 \\ C7 \\ C8 \\ C9 \end{array} \begin{array}{c} \begin{array}{ccccccccc} C1 & C2 & C3 & C4 & C5 & C6 & C7 & C8 & C9 \end{array} \\ \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix} \end{array}$$

The concept C_4 is in the on state and other nodes are in the off sate.

Let the initial input vector be

$X_o = \{ 0\ 0\ 0\ 1\ 0\ 0\ 0\ 0\ 0 \}$.

$X_o A \rightarrow \{0\ 0\ 0\ 1\ 0\ 0\ 1\ 1\ 0\} = X_1$

$X_1 A \rightarrow \{1\ 0\ 0\ 1\ 1\ 0\ 1\ 1\ 0\} = X_2$

$X_2 A \rightarrow \{1\ 0\ 0\ 1\ 1\ 1\ 1\ 1\ 1\} = X_3$

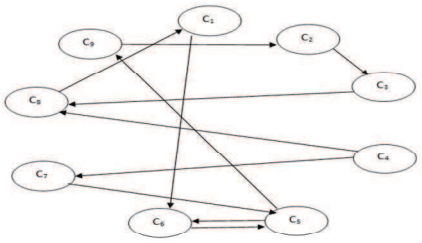
$X_3 A \rightarrow \{1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1\} = X_4$

$X_4 A \rightarrow \{1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\} = X_5$

$X_5 A \rightarrow \{1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\} = X_6 = X_5$

When C_4 (Addiction to drugs) is in "on state", all the nodes come to "on state".

Analysis of the problem combining all the three experts' views: Now we formulate the combined fuzzy cognitive maps using the opinion of three experts. Let S denote the combined connection matrix by S=A+B+C



C=	C1	C2	C3	C4	C5	C6	C7	C8	C9
C1	0	2	0	0	0	1	0	0	0
C2	0	0	2	0	1	0	0	0	0
C3	0	0	0	0	0	0	0	3	0
C4	0	0	0	0	1	0	3	1	0
C5	1	0	0	0	0	1	0	0	1
C6	1	0	0	0	1	0	0	1	0
C7	0	1	0	1	1	0	0	0	0
C8	2	1	0	0	0	0	0	0	0
C9	0	2	0	0	0	1	0	0	0

X_0= { 0 0 0 1 0 0 0 0 0 }.

$X_0 A \rightarrow \{0\ 0\ 0\ 1\ 1\ 0\ 1\ 1\ 0\} = X_1$

$X_1 A \rightarrow \{1\ 1\ 0\ 1\ 1\ 1\ 1\ 1\ 1\} = X_2$

$X_2 A \rightarrow \{1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\} = X_3$

$X_3 A \rightarrow \{1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\} = X_4 = X_3$

We notice all the nodes come up to on state expressing the collective opinion of the students, parents and the teachers.

3.3 **Future Work:** Analyzing the resultsfor impact of media on Adolescents by collecting data from the whole of TamilNadu and by using various Fuzzy Models.

3.5 Acknowledgment: The authors wish to thank the management of Hindustan University and Vel Tech Arts and Science Collegefor the constant source of encouragement and support.

4. Conclusion : While analyzing the problem using CFCM, when the attribute C_4 "Addiction to drugs" is in the on state all the nodes $C_1, C_2, C_3, C_4, C_5, C_6, C_7, C_8, C_9$ come to the onstate.Thus the influence of media affects the adolescents in many ways. Awareness education on the advantages and disadvantages of the media should be given to them so that the adolescents become mature enough to handle the media in a proper way. Judicious usage of media will help he adolescents to accelerate the process of enriched learning and will help them to be more creative and productive..

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