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Problems Faced by Lateral Entry Students Using Fuzzy Cognitive Maps (FCMS)

A. Praveenprakash[1], N. Vanathi[2], M. Goudhaman[3], Kanimozhiraman[4]

Abstract: Thousands of students are opting for technical education and joining Engineering colleges every year across the country. Encouragingly, number of students selecting the Engineering course is in uptrend. One category of engineering students' complete diploma courses and join the second year of Engineering graduate program as Lateral Entry Students(LES) in their respective stream of studies. These students are more skilled and exposed to practical aspects of their engineering discipline. But many are not used to listen and write examinations in English though the medium of instruction for them in Polytechnics is English since they are allowed to write the examinations in Tamil. They do not study eleventh and twelfth standards and I year of Engineering Course. Hence they miss the Mathematics portions taught in these classes. Many topics taught in the second year Mathematics is based on the topics taught in XI, XII std and first year of BE. For some students, exposure to English medium at college is a big challenge especially if they are from Tamil medium. Many of them cope up in due course, even though they struggle initially. In this paper, the problems faced by lateral entry students in engineering colleges is analysed and its solution is found using Fuzzy Cognitive Maps.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 [1] used this fuzzy model to study decision making in social and political system. Fuzzy Cognitive Maps (FCMs) is a power full tool, which is used in numerous fields such as social, economical, medical etc. Fuzzy Cognitive Maps are more applicable when the data in the first place is an unsupervised one. This paper is organized with the following four sections:. Section one gives the information about development of Fuzzy Cognitive Map. Section two gives the preliminaries of FCM. Section three gives the description of the problem and the final section gives the conclusion based on our study.

Key words: Cognitive maps, FCM.LES students

1. INTRODUCTION

B.Kosko [2], [3] enhanced the power of cognitive maps considering fuzzy values for the concepts of the cognitive map and fuzzy degrees of interrelationships between concepts.FCM can successfully represent knowledge and human experience, introduce concepts to represent the essential elements and the cause & effect system. More over, the data is unsupervised one and also there is uncertainty in the concepts. Hence Fuzzy tool alone has the capacity to analyze these concepts. Hence it is chosen here.

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 :FCMs is a directed graph with concepts like policies, events, etc, as nodes and causalities as edges. It represents casual relationship between concepts.

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

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

2.4 Definition : The edges e_{ij} take values in the fuzzy casual interval $[-1,1]$. $e_{ij} = 0$ indicates no causalities. $e_{ij} > 0$ indicates causal increase C_j increases as C_i increases (or C_j decreases as C_i decreases) $e_{ij} <0$ indicates casual decrease (or negative causality), C_j decreases as C_i increases (or C_j increases as C_i decreases). Simple FCMs have edge values in {-1, 0, 1}.Then if causalities occur, it occurs to a maximal positive or negative degree. Simple FCMs provide a quick first approximation to an expert is 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 exists no relation between the two concepts , the value 0 is given , If increase (or decrease) in one concept leads to decrease (or increase) in another, then we give the value -1. Thus FCMs are described in this way. Consider the concepts $C_1, C_2, \ldots, C_n$ of the FCM , Suppose the directed graph is drawn using edge weight e_{ij} ε {-1, 0, 1}. The matrix E be defined by E = (e_{ij}), where eij 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.

2.5 Definition: Let $C_1, C_2, \ldots,$ Cn 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 denotes the on-off position of the node at an instant.

$a_i = 0$ if a_i is off ,

$a_i = 1$ if a_i is on, where $i = 1, 2, \ldots, n$.

2.6 Definition: Let $C_1, C_2, \ldots, C_n$ be the nodes of an FCM. Let $\overrightarrow{C_1C_2}, \overrightarrow{C_2C_3}, \ldots, \overrightarrow{C_iC_j}$, be the edges of the FCM (i 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.

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

2.8 Definition: When 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.

2.9 Definition: Let $\overrightarrow{C_1C_2}, \overrightarrow{C_2C_3}, \ldots, \overrightarrow{C_iC_j}$, 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 $i = 1, 2, \ldots, n$. 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 a FCM with $C_1, C_2, \ldots, C_n$ as nodes. For example let us start the dynamical system by switching onC_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.

2.11 Definition:

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

METHOD OF DETERMINING THE HIDDEN PATTERN

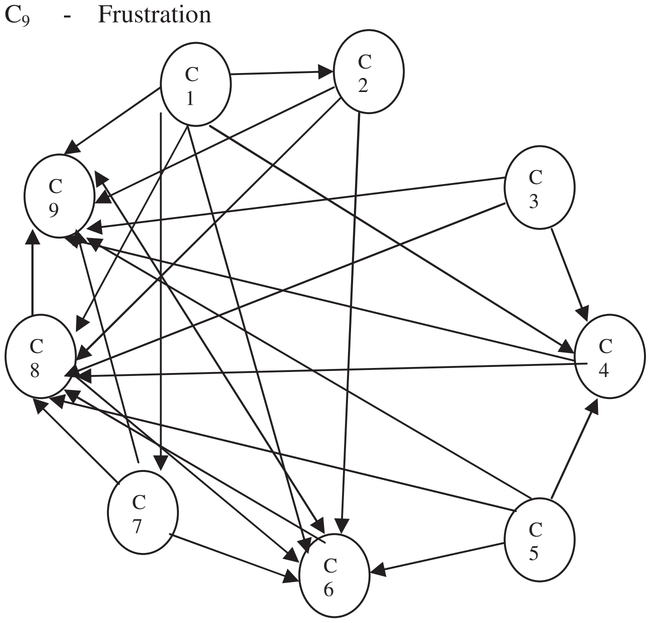
Let $C_1, C_2, ., C_n$ be the nodes of an FCM, with feedback. Let E be the associated adjacency matrix. Let us find the hidden pattern when C_1 is switched on. When an input is given as the vector $A_1 = (1, 0, 0, \ldots, 0)$, the data should pass through the relation matrix E. This is done by multiplying A_1 by the matrix E. Let $A_1E = (a_1, a_2, \ldots, a_n)$ 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_1 is included in the updated vector by making the first coordinate as 1 in the resulting vector. Suppose $A_1E \rightarrow A_2$ then consider A_2E and repeat the same procedure. This procedure is repeated till we get a limit cycle or a fixed point.

3. DESCRIPTION OF PROBLEM

Using the linguistic questionnaire and the expert's opinion we have taken the following ten concepts $\{C_1, C_2, \ldots, C_9\}$. The following concepts are taken as the main nodes for our problem.

C_1 - Late admission
C_2 - Poor in Mathematics
C_3 - Less Communication
C_4 - Treated in differently by class mates and teachers.
C_5 - Having break in studies
C_6 - Getting more arrears
C_7 - Not getting enough time to prepare
C_8 - Tension
C_9 - Frustration



The matrix associated with the above graph is

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

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Suppose we consider the ON state of the attribute "late admission"and all other states are off the effect of

$X = (1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0)$ on A is given by

$A\,X = (0\ 1\ 0\ 1\ 0\ 1\ 1\ 1\ 1)$

$\rightarrow (1\ 1\ 0\ 1\ 0\ 1\ 1\ 1\ 1) = X_1$

$AX_1 = (0\ 1\ 0\ 1\ 0\ 5\ 1\ 6\ 5)$

$\rightarrow (1\ 1\ 0\ 1\ 0\ 1\ 1\ 1\ 1) = X_2$

$X_2 = X_1$

(Where $\rightarrow$ denotes the resultant vector is thersholding and updating)

X_1 is a fixed point of the dynamical system.

4. CONCLUSION

When C_1 is ON we are getting the remaining nodes C_2, C_4, C_6,C_7, C_8,C_9 are in ON condition. Because of late admission they are facing the remaining problems poor in mathematics, treated in differently, getting more arrears, not getting enough time to prepare, tension and frustration. Once if they have a plan to join engineering degree after their diploma they have to improve their communication and mathematical skills in their vacation itself.

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[1]A.Praveen Prakash, Professor in Mathematice, Hindustan University, Chennai, apraveenprakash@gmail.com.

[2]N.Vanathi, Assistant Professor (sr.scale), KCG College of Technology, Chennai, vanathi_29@yahoo.co.in

[3]M.Goudhaman, Assistant Professor (sr.scale),Saveetha Enginnering College, Chennai, gouth74@yahoo.com.

[4]Kanimozhi Raman, Assistant Professor (sr.scale), KCG College of Technology, Chennai, kanimozhiraman@yahoo.co.in