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A Fuzzy Tool to Study the Problems Faced by Children of Working Mothers

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Abstract: In this paper, we study the problems faced by children of working mother using Fuzzy Cognitive Bimaps introduced by Dr.W.B.Vasantha Kandasamy which can function simultaneously as two FCM models having a different sets of attributes. We have used expert's opinion for the fuzzy model. This paper has five sections. First section gives the information about development of Fuzzy Cognitive Maps. Second section gives preliminaries of Fuzzy Cognitive Maps and Fuzzy Cognitive BiMaps. In section three, we explain method of determining the hidden pattern. In the fourth section, we analyze the problems faced by children of working mothers. Final section gives the conclusion based on our study.

Keywords: Fuzzy cognitive BiMaps, Hidden pattern, Limit cycle.

1. INTRODUCTION: DEVELOPMENT OF FUZZY COGNITIVE MAPS:

In 1965, L.A. Zadeh has introduced a mathematical model called Fuzzy Cognitive Maps.Political scientist R. Axelrod [1] introduced cognitive maps for representing social scientific knowledge and describing the methods that are used for decision making in social and political systems. Then B. Kosko [2] - [4] 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; introduce 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, economic, medical etc. children of working mothers are facing loneliness, frustration, insecurity, health problems etc which lead to several behavioral changes in children. With this background information a study was conducted to assess the problems of children of working mothers. Moreover, 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 causal relations between classes.

Definition 2.1: 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 2.2: When the nodes of the FCM are fuzzy sets then they are called as fuzzy nodes.

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

Definition 2.4: 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 of 1. If there exists no relation between two concepts, the value 0 is given. If increase (or decrease) in one concept decreases (or increases) another, then we give the value –1. Thus FCMs are described in this way, Consider the nodes or concepts $C_1,\ldots,C_n$ 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 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 2.5: 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 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 $i = 1, 2,\ldots , n$.

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

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

Definition 2.8: 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.

Definition 2.9: Let $\overrightarrow{C_1C_2}$, $\overrightarrow{C_2C_3}$,… , $\overrightarrow{C_iC_j}$ 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 = 1, 2, , n. The equilibrium state for this dynamical system is called the hidden pattern.

Definition 2.10: 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, …, 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 2.11: 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.

Definition 2.12: Fuzzy Cognitive Bimaps (FCBMs) are fuzzy signed directed bi-graphs with feedback. The directed edge e_{ij} from causal concept c_i to concept c_j measures how much c_i causes c_j . The edge e_{ij} takes values in the fuzzy causal interval [-1, 1], $e_{ij} = 0$ indicates no causality $e_{ij} > 0$ indicates causal increase c_j increases c_i increases (or c_j as c_i decreases). $e_{ij} < 0$ indicates causal decrease c_i decreases as c_j increases (and or c_j increases or c_i decreases).

3. 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,., 0), the data should pass through the relation matrix E. This is done by multiplying A_1 by the matrix E. Let $A_1E = (a_1, a_2, ., a_n)$ 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.

4. ANALYSIS OF PROBLEM

Gone are the days when mother devoted her full life for development of her children. Today, women are becoming more active, independent and prefer progress in their career rather than been recognized as just house makers. Due to economical problems and inflation, it is essential for everyone to make more efforts for good earning. In such case it is necessary for a woman to understand her responsibilities and start working to help her husband to reduce their financial crisis. Hence most of the mothers are working. They are unable to take proper care of their children, which leads to several behavioral changes in children. Those behavioral changes thereby affects our nation's growth as India's future lies in their hands. If we have two FCMs given by two different experts with two different set of attributes on the same problem we can use the Fuzzy Cognitive Bimaps model i.e., if M_1 is the connection matrix of the FCM given by the first set of expert on the problem P and M_2 is the connection matrix of the FCM given by second set of expert on the same problem P, the two sets of attributes give the bimatrix of the Fuzzy Cognitive Bimaps(FCBMs).The functioning of the FCBMs will be explicitly shown in the following section. Dr.Vasantha Kandasamy used this tool with two different sets of attribute in the paper "Reservation for Minorities in Central Government Educational Institution". In this paper we have used the set of attributes given by two experts are not disjoint and the directed bigraph is connected by a vertex.

The two sets of experts are
1. Children of working mother.
2. Doctors, Teachers.

4.1. Directed Bigraph Is Connected By A Vertex: The set of attributes given by the first expert is
1. loneliness.
2. Frustration.
3. Insecurity.
4. Work more than their ability.
5. Not getting proper food and proper care when they are sick.
6. Health Problem.

The set of attributes given by the second expert is
1. Dotted child.
2. Adamant.
3. Attending school function without their parents.
4. Behavior changes.
5. No proper care in the studies.
6. Health Problems.
7. Usage of social networks.

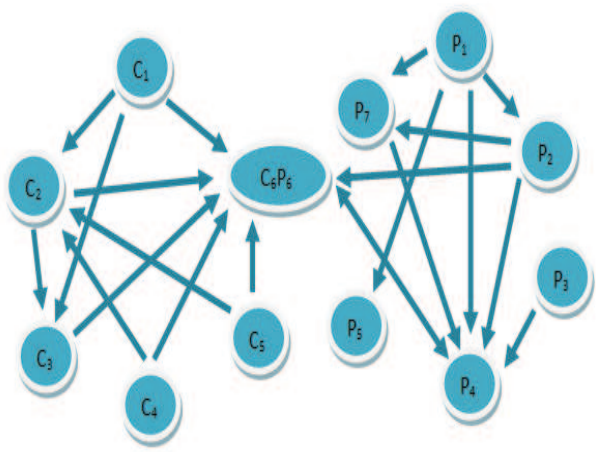

Fig. 1. Directed Graph

Here the attributes C_6 and P_6 are same

The connection bimatrix $M = M_1 \cup M_2$ associated with this pair of attributes $\{C_1,C_2,C_3,C_4,C_5,C_6\}$ and $\{P1,P2,P3,P4,$

$P5,P6\}$ is given below

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

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

Suppose we work with the ON state of the bivector

$X = X_1 \cup X_2$

$= (1\,0\,0\,0\,0\,0) \cup (1\,0\,0\,0\,0\,0)$

X_1 and X_2 are arbitrary we can take any state in ON condition.

$X = X_1 \upsilon X_2$

$= (1\,0\,0\,0\,0\,0) \upsilon (1\,0\,0\,0\,0\,0)$

$X \circ M = (X_1 \upsilon X_2) \circ (M_1 \upsilon M_2)$

$= (X_1 \circ M_1) \upsilon (X_2 \circ M_2)$

$= (0\,1\,1\,0\,0\,1) \upsilon (1\,0\,0\,1\,1\,0\,1)$

$(1\,1\,1\,0\,0\,1) \upsilon (1\,0\,0\,1\,1\,0\,1)$

$= Y_1 \upsilon Y_2 = Y$

$Y \circ M = (Y_1 \upsilon Y_2) \circ (M_1 \upsilon M_2)$

$= (Y_1 \circ M_1) \upsilon (Y_2 \circ M_2)$

$= (0\,1\,2\,0\,0\,3) \upsilon (1\,0\,0\,2\,1\,1\,2)$

$(1\,1\,0\,0\,1) \upsilon (1\,0\,0\,1\,1\,1\,1)$

$= Z_1 \upsilon Z_2 = Z$

$Z \circ M = (Z_1 \upsilon Z_2) \circ (M_1 \upsilon M_2)$

$= (Z_1 \circ M_1) \upsilon (Z_2 \circ M_2)$

$= (0\,1\,2\,0\,0\,3) \upsilon (1\,0\,0\,4\,1\,1\,2)$

$(1\,1\,0\,0\,1) \upsilon (1\,0\,0\,1\,1\,1\,1)$

$= A$

$A = Z$

(Symbol denotes that the bivector has been updated and thresholded)

5. CONCLUSIONS

As per first set of expert's opinion if loneliness is in ON state then Frustration, Insecurity and Health Problems are in ON condition. As per second set of expert's opinion if Dotted child is in ON state then it has an impact over the remaining states such as Behaviour changes, No proper care in the studies, Health Problems and Usage of social networks.

6. SUGGESTIONS BASED ON OUR STUDY

Not all children have the necessary skills to make friends. Parents sometimes need to teach those skills and help their children become proficient in making friends and relating to others. Social skills are much like academic subjects. Learning about them requires focus and motivation. Telling a child to take interest in other children's hobbies and pastimes can be the first step towards making a friend. Plan some activities to promote friendships. Outings, games, sleepovers, scavenger hunts, walks, cooking, and sports are just a few of the many activities you can organize to help children ease isolation and loneliness. The children are needed to be taught by parents on how they can be careful when left alone at home. It is also better to provide them a phone to contact the parents at the time of emergency. Children must know how they can fruitfully engage their leisure times when parents are away from them. Parents can enroll their kids in some co-curricular activities such as sports, arts, etc., as such activities would help them not only to avoid loneliness but also to develop certain skill sets that would help in building their personality in an harmonious way. Parents should spend more time with their children. If they are busy they can spend at least an hour per day for their children. Children's progress in studies and their day-to-day activities should be constantly

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monitored by parents and suitable encouragement can be provided. Parents should plan their weekend activities by discussing with their kids. Parents may tell bed time stories. This brings closeness between parents and children. At last, the most important aspect in parenting is to lend their ears to their children when they are saying something with at most attention and try to fulfill their right derives. A child would not need more than that.

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