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Using Fuzzy Cognitive Map and Induced Fuzzy Cognitive Map to Analyze Real World Problems

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Abstract. In last few years Private Organization or Information Technology (IT) organization are known as hot sector for investment. Employees' performance plays a vital or critical role towards the growth of any private or IT organization. Employees play a good role to produce and increasing Indian software or any other services in terms of both profit and global developments of customers in the global platform. But to reach the goal, they are insensitive to their social and personal life. Private employees those who work in various sector mainly IT field are facing mental stress, staying away from families, divorce, visions problem, affected by various addictions. We have analyzed the problem of their daily life with the help of Fuzzy Cognitive Maps (FCM) and Induced Fuzzy Cognitive Map (IFCM). FCMs and IFCMs are fuzzy-graph modelling approaches based on expert's opinion. This is the non-statistical approach to study the problem with imprecise information. FCM and IFCM is the best suited tool when the data is an unsupervised one.

Keywords: Fuzzy Cognitive Map, Induced Fuzzy Cognitive Map, Private Sector

AMS Mathematics Subject Classification (2010): 03B52, 28E10, 15B15

1. Introduction

The Fuzzy model is a finite set of fuzzy relations that form an algorithm for determining the outputs of a process from some finite number of past inputs and outputs. Fuzzy Model can be used in applied mathematics, to study social and psychological problem and also used by doctors, engineers, scientists, industrialists and statisticians. Fuzzy models are mathematical tools introduced by Zadeh (1965). Later Politician scientist Axelord (1976) [11] used this fuzzy model Cognitive Map (CM) to study decision making in social and political systems. CM is signed digraph design to represent causal assertion and belief system of a person (or group experts) with respect to a specific domain, and use that statement in order to analyze the effect of a certain choice on a particular objective.

Using the concepts of neural networks and fuzzy logical approach Bart Kosko (1986) proposed some models which extend the idea of Cognitive Map by allowing the concept to be represented linguistically with an associated fuzzy set. This model are well suited to get a clear representation of the knowledge to support decision making process and assist in the area of computational intelligence, which involves the application of soft

computing methodologies even though the given inputs are vague, uncertain and even contradictory in nature. We have used FCM and its advanced version which is called as Induced Fuzzy Cognitive Map (IFCM) which has introduced by Pathinathan [14,15]. IFCM are a fuzzy-graph modelling approach based on expert's opinions. This is non-statistical approach to study the problems with imprecise information. This model have also become very essential that plays a vital role in several real world problems like various infectious diseases (cancer, tuberculosis, migration etc.), students life in rural area, problems of private employees in their day-to-day life etc. Among these problems we are going to discuss about a particular one. Our main objective of this paper is to analyze the daily life problems which are faced by private sector mainly IT workers and Corporate Sector employees in India and find out its solutions using FCM and IFCM.

The paper is organized in six sections. Section two presents basic definition of FCM. Section three draws a model of daily life problem of private sector employees. Section four defines the algorithm of IFCM. Section five gives the mathematical approach of IFCM. Section six presents about the difference between FCM and IFCM. In Seventh Section draws conclusions based on our study.

2. Preliminaries

Before the discussion of Fuzzy Cognitive Map (FCM) we describe about the Cognitive Map (CM). CMs were introduced by Axelord (1976) [11], in order to develop and study social scientific knowledge in the field of decision-making in activities related to international politics. CM are signed digraphs designed to represent causal assertion and belief system of a person (or group of experts) with respect to a specific domain, and use that statement in order to analyze the effect of a certain choice on particular objectives.

2.1. Fuzzy cognitive map

Fuzzy Cognitive Map (FCM) introduced by Kosko (1986) who extends the idea of Cognitive Maps by allowing the concepts to be represented linguistically with an associated fuzzy set. FCMs are fuzzy signed digraph with feedback (Kosko, 1986, 1988). FCMs link causal events, actor, value and trends to a fuzzy feedback dynamical system. FCMs list the fuzzy rule or causal flow paths that relate events.

2.2. Formation of fuzzy cognitive map

FCM represents causal relationship between concepts. If increase in one concept/node leads to increase in another concept, we assign the value 1 and for decreasing we assign the value -1. If there exists no relation between concepts the value 0 is given

Definition 1. Consider $C_1, C_2, \dots, C_2$ be the nodes of the FCM. Suppose the directed graph is drawn using edge weight $e_{ij} \in \{0, 1, -1\}$. The matrix E be defined by $E = (e_i)$ where e_{ij} is the weight of the directed edge $C_i C_j$. E is called the adjacency matrix of the FCM. All matrices associated with an FCM are always square matrices with diagonal entries as zero.

Definition 2. Now the instantaneous state vector $A = (a_1, a_2, \dots, a_n)$ where $a_i \in \{0, 1\}$, and it denotes the on-off position of the node at an instant i.e. $a_i = 0$ if a_i is off and $a_i = 1$if a_i is on for $i = 1, 2, \dots, n$

Definition 3. Let $C_1C_2, C_2C_3, \dots, C_iC_j$ be the nodes of the edge of the FCM ($i \neq j$) form a directed cycle and FCM is said to be cyclic if it possesses a directed cycle. Otherwise it is acyclic.

Definition 4. FCMs with cycles is said to have a feedback i.e. when the causal relations flow through a cycle in a revolutionary way, FCMs is called a dynamical system.

Definition 5. When C_i $(i = 1, 2, .., n)$ is switched on and if the causality flows through the edges of a cycle and if it again causes C_i, we say that dynamical system goes round and round.

Definition 6. The equilibrium state for this dynamical system is called the hidden pattern. If the equilibrium state of a dynamical system is a unique state vector, then is called fixed point.

Definition 7. If FCMs settles down with a state vector repeating in the form $A_1 \rightarrow A_2 \rightarrow \dots\dots \rightarrow A_i \rightarrow A_1$, then this equilibrium is called a limit cycle.

Definition 8. Finite number of FCMs can be combined together to produce the joint effect of all FCMs. Let $E_1, E_2, \dots, E_p$ be the adjacency matrices of all FCMs with nodes i.e. Combined FCMs denotes the relational matrix by $E = E_1 + \cdots + E_p$.

Definition 9. Suppose $A = (a_1, a_2, \dots, a_n)$ is a vector which is passed into a dynamical system E. Then $AE = (a'_1, \dots, a'_n)$ after thresholding and updating the vector suppose we get $(b_1, \dots, b_n)$. We denote that by $(a'_1, \dots, a'_n) \Subset (b_1, \dots, b_n)$. Thus the symbol ' $\Subset$ 'means the resultant vector has been threshold and updated.

2.3 Application of FCM

FCMs have been used in many different ways; some of them are listed below.

a) HIV/AIDS affected migrant labourers socio-economic problem
b) Maximum utilization of a time period in a day of the traffic route
c) Study of political situation
d) Study of probing causes of child labour
   Study of employee-employer relationship.

3. Model illustration FCMs

The focus of this paper is on work-family balance practices in action with a particular emphasis on private sector employment contexts. Work life balance is a self-defined, self-determined state of well being that a person can reach, or can set as a goal, that allows them to manage effectively multiple responsibilities at work, at home, and in their community; it supports physical, emotional, family and community health, and does so without grief, stress or negative impact. Most private-sector workers are "at-will" employees and may be fired for any reason. They are so much serious about their own work and cannot concentrate or participate on their social life. In private sector mainly IT workers face various problems related to social life. Here we have drawn relationship model taking in account 12 different parameters of employees daily life. We have

illustrated a general study to access the impact of problems faced by the private sector mainly IT workers and Corporate sector employees in the age group of 25-40. We consider the dynamical system of this problem. With the help of this model we find the hidden pattern of this model. This is very important, that we have several nodes and several opinions to draw various model of this relationship. Several models can give us best picture and clear idea of this model. Here we have to consider only one model. We use the following 12 nodes /concepts of FCM:-

$C_1 \rightarrow$ Divorce
$C_2 \rightarrow$ Misunderstanding with family
$C_3 \rightarrow$ Argument with partners and family
$C_4 \rightarrow$ Working in shift
$C_5 \rightarrow$ Lack of holidays
$C_6 \rightarrow$ Insomnia (Inability to sleep)
$C_7 \rightarrow$ Mental stress
$C_8 \rightarrow$ Vision problem
$C_9 \rightarrow$ Due to depression lean out to alcohols, resulting various accident.
$C_{10} \rightarrow$ Less immunity feeling sick always
$C_{11} \rightarrow$ Staying away from relatives (family)
$C_{12} \rightarrow$ Competition with colleague and co-operation problems.

According to the experts opinions of the above problems converted into a collection matrix X.

X=

	C_1	C_2	C_3	C_4	C_5	C_6	C_7	C_8	C_9	C_{10}	C_{11}	C_{12}
C_1	0	1	1	0	0	1	1	0	1	0	0	0
C_2	1	0	1	0	0	1	1	0	1	0	0	1
C_3	1	1	0	0	0	1	1	0	1	0	0	0
C_4	1	1	1	0	1	1	1	1	1	1	1	1
C_5	0	1	1	0	0	0	1	0	1	1	1	0
C_6	0	0	0	0	0	0	1	1	1	1	0	0
C_7	0	0	0	0	0	1	0	1	1	0	1	0
C_8	0	0	0	1	1	0	0	0	0	0	0	0
C_9	1	1	1	0	0	1	1	0	0	1	1	0
C_{10}	0	0	0	0	0	0	1	1	1	0	0	0
C_{11}	1	1	1	0	0	0	1	0	0	0	0	0
C_{12}	0	0	1	0	0	1	1	0	0	0	0	0

Table 1: Adjacency matrix X of FCM

CASE 1:

Let us take X_2 i.e." Misunderstanding with family " to be the on state i.e. $P_1 = (0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0)$ i.e. all other states are off state, passing P_1 to the connection matrix and of course after updating and thresholding the resultant vector we get,

$$P_1 = (0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0)$$
$$P_1X = (1\ 0\ 1\ 0\ 0\ 1\ 1\ 0\ 1\ 0\ 0\ 1)$$
$$\Subset (1\ 1\ 1\ 0\ 0\ 1\ 1\ 0\ 1\ 0\ 0\ 1) = P_2$$
$$P_2X = (3\ 3\ 4\ 0\ 0\ 6\ 6\ 1\ 5\ 1\ 2\ 1)$$
$$\Subset (1\ 1\ 1\ 0\ 0\ 1\ 1\ 0\ 1\ 1\ 1\ 1) = P_3$$

$$P_3X = (4\ 4\ 5\ 1\ 1\ 6\ 8\ 4\ 6\ 2\ 2\ 1)$$
$$\circlearrowleft (1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1) = P_4$$
$$P_4X = (5\ 6\ 7\ 1\ 1\ 7\ 10\ 4\ 8\ 4\ 4\ 1)$$
$$\circlearrowleft (1\ 1\ 1\ 1\ 1\ 1\ 1\ 4\ 1\ 1\ 1\ 1) = P_5 = P_4$$

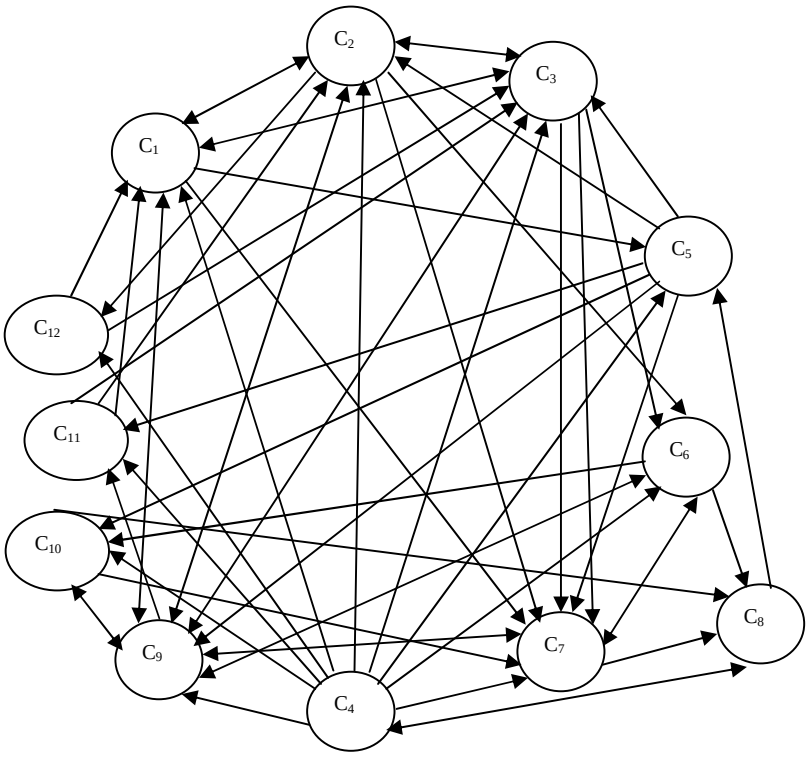

Figure 1: Employer's real life problem model representation by a directed graph

Here in node P_5 equilibrium state of dynamical system is a unique state vector Thus the result is fixed point. Now we have to say that ." Misunderstanding with family"(X_2) effects the other nodes like "Divorce"(C_1), "Argument with partners and family"(C_3), "Working in shift"(C_4), "Lack of holidays"(C_5), "Insomnia (Inability to sleep)"(C_6), "Mental stress (C_7), "Vision problem"(C_8), "Due to depression lean out to alcohols, resulting various accident."(C_9), "Less immunity feeling sick always"(C_{10}), "Staying away from relatives (family)" (C_{11}), "Competition with colleague and co-operation problems"(C_{12}).

Similarly, we have to consider other cases from which we have to find the hidden pattern for the system.

3. Algorithm approach in induced Fuzzy Cognitive Map

Now we have to discuss another type of fuzzy model which is modified version of FCM called Induced Fuzzy Cognitive Maps (IFCMs). IFCMs focussed on algorithmic approaches of FCMs which works on unsupervised data to derive an optimistic solution.

To derive an optimistic solution to the problem with unsupervised data, the following steps to be followed.

Step 1: Collect the nodes for the given problem, which is unsupervised data that is in determinant factors.

Step 2: Draw the directed graph (FCMs) for the model, according to the expert opinion.

Step 3: From FCMs, obtain the connection matrix X. Here the number of rows in the given matrix= number of steps to be performed.

Step 4: Consider the state vector $V(K_1)$, by setting the first component of this vector C_1 in ON position which is denoted by 1 and the rest of the components as 0 which are in OFF position.

Step 5: Find $M = C_1 \times X$. At each stage the state vector is updated and threshold. The symbol '$\Leftarrow$' represents the threshold value for the product of the result. The threshold value is calculated from M by assigning 1 for the values $x_1 > 0$ and assigning 0 when $x_1 < 0$.

Step 6: Now each component in the C_1 vector is taken separately and product of the given matrix is calculated. Find out the vector y_1 which has maximum number of one's.

Step 7: Considered as fixed point when the same threshold value occurs twice and the iteration gets terminated.

Step 8: Set the state vector C_2 in ON state which is assigning the second component of the vector to be 1 and the rest of the components as 0. Precede the calculations discussed in steps 4 to 7.

Step 9: Continue the above process for the all the remaining state vector C_n and the find out the hidden pattern.

4. Analyze the given problem using IFCM method

At the first stage, we have taken the following twelve concepts $\{C_1, C_2, \ldots, C_{12}\}$ using linguistic questionnaire and the expert's opinion. It is not mandatory to consider only these twelve attributes when we illustrate this problem. We have discussed about the nodes in previous section.

Case 1. Using the matrix X, consider the node C_1 (Divorce) as the ON state and all the remaining nodes are in the OFF state.

Let $C_1(1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0)$

$C_1E = (0\ 1\ 1\ 0\ 0\ 1\ 1\ 0\ 1\ 0\ 0\ 0) = C_1$

Now as per algorithm, each component in the C_1 vector is taken separately and product of the given matrix E is calculated. The vector has maximum number of one's which occurs first denoted as y_1. Here $(1\ 1\ 1\ 0\ 0\ 1\ 1\ 0\ 0\ 1\ 1\ 0)$ consider as y_1.

$C_1'X \approx$

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

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

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

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

$(0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 1\ 0\ 0\ 0)\mathrm{X} = (1\ 1\ 1\ 0\ 0\ 1\ 1\ 0\ 0\ 1\ 1\ 0)$

$y_1\mathrm{X} = (1\ 1\ 1\ 0\ 0\ 1\ 1\ 0\ 0\ 1\ 1\ 0)\mathrm{X}$
$= (3\ 3\ 3\ 0\ 0\ 4\ 6\ 3\ 6\ 1\ 1\ 1)$
$\Subset (1\ 1\ 1\ 0\ 0\ 1\ 1\ 1\ 1\ 1\ 1\ 1) = C_2$

Threshold value $\Subset$ is calculated by assigning 1 for the values > 0 and assigning 0 for the values < 0.

$C_2'\mathrm{X} \approx$

$(1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0)\mathrm{X} = (0\ 1\ 1\ 0\ 0\ 1\ 1\ 0\ 1\ 0\ 0\ 0)$
$(0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0)\mathrm{X} = (1\ 0\ 1\ 0\ 0\ 1\ 1\ 0\ 1\ 0\ 0\ 1)$
$(0\ 0\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0)\mathrm{X} = (1\ 1\ 0\ 0\ 0\ 1\ 1\ 0\ 1\ 0\ 0\ 0)$
$(0\ 0\ 0\ 0\ 0\ 1\ 0\ 0\ 0\ 0\ 0\ 0)\mathrm{X} = (0\ 0\ 0\ 0\ 0\ 0\ 1\ 1\ 1\ 1\ 0\ 0)$
$(0\ 0\ 0\ 0\ 0\ 0\ 1\ 0\ 0\ 0\ 0\ 0)\mathrm{X} = (0\ 0\ 0\ 0\ 0\ 1\ 0\ 1\ 1\ 0\ 1\ 0)$
$(0\ 0\ 0\ 0\ 0\ 0\ 0\ 1\ 0\ 0\ 0\ 0)\mathrm{X} = (0\ 0\ 0\ 1\ 1\ 0\ 0\ 0\ 0\ 0\ 0\ 0)$
$(0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 1\ 0\ 0\ 0)\mathrm{X} = (1\ 1\ 1\ 0\ 0\ 1\ 1\ 0\ 0\ 1\ 1\ 0)$
$(0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 1\ 0\ 0)\mathrm{X} = (0\ 0\ 0\ 0\ 0\ 0\ 1\ 1\ 0\ 0\ 0\ 0)$
$(0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 1\ 0)\mathrm{X} = (1\ 1\ 1\ 0\ 0\ 0\ 1\ 0\ 1\ 0\ 0\ 0)$
$(0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 0\ 1)\mathrm{X} = (0\ 0\ 1\ 0\ 0\ 1\ 1\ 0\ 1\ 0\ 0\ 0)$

Consider $(1\ 1\ 1\ 0\ 0\ 1\ 1\ 0\ 0\ 1\ 1\ 0)$ as y_2. When we again pass y_2 on the product matrix X the same result occurs $(1\ 1\ 1\ 0\ 0\ 1\ 1\ 0\ 0\ 1\ 1\ 0)$ as y_3. According the IFCMs method when the same threshold value occurs twice, the value is considered as the fixed point and the iteration gets terminated and the calculation gets terminated. Now the triggering pattern is $\mathrm{C}_1 \to \mathrm{C}_9 \to \mathrm{C}_9$ when the first attribute is kept in on state.

Number	**Attribute ON state**	**Triggering pattern**
Step 1	C_1: (1 0 0 0 0 0 0 0 0 0 0 0)	$\mathrm{C}_1 \to \mathrm{C}_9 \to \mathrm{C}_9$
Step 2	C_2: (0 1 0 0 0 0 0 0 0 0 0 0)	$\mathrm{C}_2 \to \mathrm{C}_9 \to \mathrm{C}_9$
Step 3	C_3: (0 0 1 0 0 0 0 0 0 0 0 0)	$\mathrm{C}_3 \to \mathrm{C}_9 \to \mathrm{C}_9$
Step 4	C_4: (0 0 0 1 0 0 0 0 0 0 0 0)	$\mathrm{C}_4 \to \mathrm{C}_9 \to \mathrm{C}_9$
Step 5	C_5: (0 0 0 0 1 0 0 0 0 0 0 0)	$\mathrm{C}_5 \to \mathrm{C}_9 \to \mathrm{C}_9$
Step 6	C_6: (0 0 0 0 0 1 0 0 0 0 0 0)	$\mathrm{C}_6 \to \mathrm{C}_9 \to \mathrm{C}_9$
Step 7	C_7: (0 0 0 0 0 0 1 0 0 0 0 0)	$\mathrm{C}_7 \to \mathrm{C}_9 \to \mathrm{C}_9$
Step 8	C_8: (0 0 0 0 0 0 0 1 0 0 0 0)	$\mathrm{C}_8 \to \mathrm{C}_4 \to \mathrm{C}_9 \to \mathrm{C}_9$
Step 9	C_9: (0 0 0 0 0 0 0 0 1 0 0 0)	$\mathrm{C}_9 \to \mathrm{C}_1 \to \mathrm{C}_9 \to \mathrm{C}_9$ $\mathrm{C}_9 \to \mathrm{C}_3 \to \mathrm{C}_9 \to \mathrm{C}_9$ $\mathrm{C}_9 \to \mathrm{C}_{11} \to \mathrm{C}_9 \to \mathrm{C}_9$

Step 10	C_{10}: (0 0 0 0 0 0 0 0 0 1 0 0)	$C_{10} \rightarrow C_7 \rightarrow C_4 \rightarrow C_9 \rightarrow C_9$
Step 11	C_{11}: (0 0 0 0 0 0 0 0 0 0 1 0)	$C_{11} \rightarrow C_9 \rightarrow C_9$
Step 12	C_{12}: (1 0 0 0 0 0 0 0 0 0 0 1)	$C_{12} \rightarrow C_9 \rightarrow C_9$

Table 2: Induced pattern for matrix X by IFCMs

The Table 2 helps us to study the triggering patterns of a particular node which are in ON state when the remaining nodes are in OFF state.

In IFCMs before plotting the graph of the given problem we concentrate on assign the matrix. So we consider all the nodes to find out the major one. In this problem we consider only twelve nodes.

The interrelationship between the nodes of the below diagram states that C_9 (Due to depression lean out to alcohols, resulting various accident) is terminal node and C_3 (Argument with partners and family), C_{11} (Staying away from relatives (family)), C_1 (Divorce) is the intermediary node of this discussed problem.

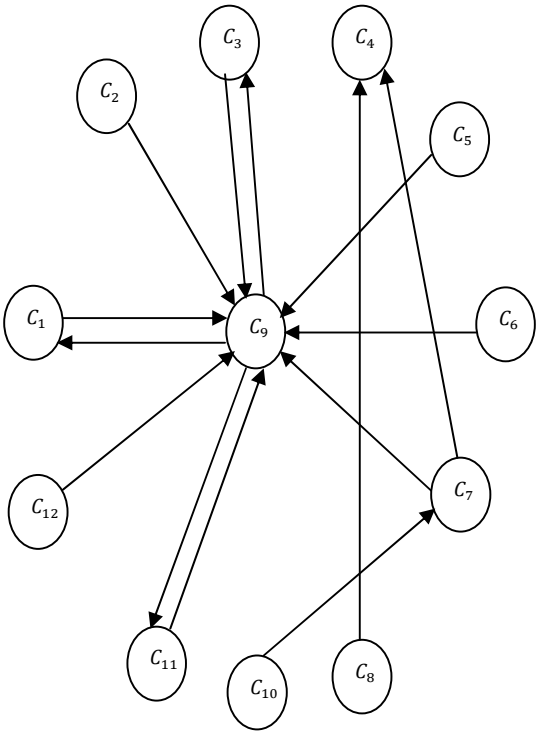

Figure 2: Induced graph on directed merged graph

5. Comparison between FCM and IFCM

FCMs have several advantages on various fuzzy models. The main advantage of this method is the method is easy to handle and based on expert's opinion. It also helps to work when the data is unsupervised. This fuzzy model helps us to find out the hidden pattern of any type of given problem in any situation.

Although this FCMs method is so simple and unique, it has some limitations also. First, this model consists of lengthy procedure for calculation when the matrices have higher number of rows and columns. Second, the manual calculation is fully based on Expert's opinion which may lead the personal bias.

But to deal with unsupervised data, IFCMs model predicates the appropriate results when comparing with FCMs model. The induced graph can be drawn after considering all the nodes of the given problem. Sometimes graphical representation of FCM is so much complicated compare to IFCMs. The IFCMs method clearly defined the terminal node which is most critical one and also shows the intermediary node which helps us to analyze the given problem.

6. Conclusion

In this section we have discussed the major problem of the private sector mainly IT workers and corporate sector employees which are evolved through IFCMs method. The above discussed algorithm of the given problem focussed on the node $C_9(1\ 1\ 1\ \ 0\ 0\ 1\ 1\ 0\ 0\ 1\ 1\ 0)$ i.e. "Due to depression lean out to alcohols, resulting various accident" which plays role of fixed point and C_1(divorce), C_2(Misunderstanding with family), C_3 (Argument with partners and family), C_6 (Insomnia (Inability to sleep)), C_7(Mental stress), C_{10}(Less immunity feeling sick always), C_{11}(Staying away from relatives family) is the major problem of the private sector employees. To reduce the problem of their real life they should follow some remedial measures which are discussed in bellow.

i. Prevention of divorce: Spend more time with family members in weekend. In holidays they should go for outing. They must attend the phone call even when they are in office.
ii. Prevention of misunderstanding with family: They should abandon their stress and pressure at office: Do not interfere job related problem in personal life.
iii. Prevention of argument with partners: Less of accordance among colleagues, which create argument in them. They should develop the power of abidance. They should leave the habits of abasing their co-partners and mentality of abduction.
iv. Prevention of insomnia: They should regularly practice of meditation to reduce tension hence increase concentration.
v. Prevention mental stress: They should reject the race of being robust. They should concentrate on work and focus on their own personal life.
vi. Prevention of less immunity feeling sick always: Take healthy food and food full of proper nutrients in definite time. They should try to abstain from alcohols. Nosooner he or she feel sick than must take prescribed vitamin tablets.
vii. Prevention of staying away from relatives: They should maintain regular contact with relative through phones or other social sites. Comeback to home in long holidays or invite native. They should make good friend to recover loneliness.

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