Stress is the body’s reaction to any change that requires an adjustment or response. Stress is a normal part of life. One can experience stress from environment, their body and thoughts. Stress is the body’s reaction to any change that requires an adjustment or response. Stress is a normal part of life.

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[6] used this Fuzzy model to study decision making in social and political systems. Then B.Kosko [1],[2],[3] 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. Stress, a common problem is one of the leading causes to affect human health. The purpose of study is to identify the risk groups. Stress is a normal part of life. One can experience stress from environment, their body and thoughts. Stress is the body’s reaction to any change that requires an adjustment or response. The body reacts to these changes with physical, mental and emotional responses. In this paper, various factors for stress are discussed and finally the major factors are identified.

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.

Definition

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

Definition

FCMs with edge weights or casualities from the set -1,0,1 are called simple FCMs.

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.

Definition

Consider the nodes/concepts $C_1$, $C_2$…., $C_n$ of the FCM. Suppose 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 $C_iC_j$. $E$ 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.

**Definition**

Let $C_1, C_2, ..., C_n$ be the nodes of an FCM. $A = (a_{ij})_{n \times n}$ where $a_{ij} \in \{-1, 0, 1\}$. $A$ 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 $i = 1, 2, ..., n$.

**Definition**

Let $C_1, C_2, ..., C_n$ be the nodes of an FCM. Let $C_1C_2, C_2C_3, C_3C_4, ..., C_{n-1}C_n$ 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**

An FCM is said to be cyclic is said to have a feedback.

**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.

**Definition**

Let $C_1C_2, C_2C_3, C_3C_4, ..., C_{n-1}C_n$ be a cycle. When $C_i$ is switched on and if the casualty 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**

If the equilibrium state of a dynamical system is a unique state vector, then it is called a fixed point. Consider an FCM with $C_1, C_2, ..., C_n$ 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$(1, 0, 0, ..., 0)$ is called fixed point.

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 a limit cycle.

**Definition**

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

**Definition**

Let $C_1, C_2, ..., C_n$ be $n$ distinct attributes of a problem $n$ very large and a non prime. If we divide $n$ into $k$ 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 large and a non prime. If we divide $n$ into $k$ equal classes i.e., $k/n = t$ which are disjoint and if we find the directed graph of each of there $k$ 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.

**Definition**

Suppose $A = (a_{11}, a_{12}, ..., a_{nn})$ is a vector which is passed in to a dynamical system $E$. Then $AE = (a_{1}', a_{2}', ..., a_{n}')$ after thresholding and updating the vector suppose we get $(b_1, b_2, ..., b_n)$. We denote that by $(a_{1}', a_{2}', ..., a_{n}') \rightarrow (b_1, b_2, ..., b_n)$. Thus the symbol $\rightarrow$ 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 $C_iC_j$, we have the sum adding to zero, thus at all times the
connection matrices \( E_1, E_2, \ldots, E_k \) 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.

METHOD OF DETERMINING THE HIDDEN PATTERN
Let \( C_1, C_2, \ldots, C_n \) 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 \( A_1 = (1,0,\ldots,0) \), 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 \( a_i \geq k \) 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 \( A_1E \cap A_2 \) then consider \( A_2E \) and repeat the same procedure. This procedure is repeated till we get a limit cycle or a fixed point.

CONCEPTS OF THE PROBLEM
Using the linguistic questionnaire and the expert’s opinion we have taken the following fifteen attributes \( \{A_1, A_2, \ldots, A_{15}\} \).

\( A_1 \) – Working under dangerous conditions
\( A_2 \) – Divorce.
\( A_3 \) – Fear and uncertainty
\( A_4 \) – Un realistic expectations
\( A_5 \) – Death of a loved one
\( A_6 \) – Heavy work load
\( A_7 \) – Being insecure
\( A_8 \) – Attitudes and Perceptions
\( A_9 \) – Loss of a job
\( A_{10} \) – Working long hours
\( A_{11} \) – Change
\( A_{12} \) – Chronic illness or Injury.
\( A_{13} \) – being un happy in job
\( A_{14} \) – Traumatic event
\( A_{15} \) – Emotional Problems

These 15 attributes are divided into 3 classes \( C_1, C_2, C_3 \) with 5 in each class.

Let \( C_1 = \{A_1, A_6, A_7, A_{10}, A_{13}\} \)
\( C_2 = \{A_2, A_5, A_9, A_{12}, A_{15}\} \)
\( C_3 = \{A_3, A_4, A_{10}, A_{11}, A_{14}\} \)

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 \( C_1 = \{A_1, A_6, A_7, A_{10}, A_{13}\} \) is in the form of the directed graph.

\[
\begin{bmatrix}
0 & 0 & 1 & 0 & 1 \\
0 & 0 & 0 & 1 & 1 \\
1 & 0 & 0 & 0 & 1 \\
0 & 1 & 0 & 0 & 1 \\
0 & 0 & 0 & 0 & 0
\end{bmatrix}
\]

The directed graph is given by the expert on . The directed graph is given by the expert on \( \{A_2, A_5, A_9, A_{12}, A_{15}\} \) which forms the class \( C_2 \).
According to this expert the attribute loss of a job is interrelated with chronic illness or injury. Also the attribute loss of a job is interrelated with emotional problems. The attribute divorce is interrelated with emotional problems. The attribute divorce is related to chronic illness or injury. Also the attributes death of a loved one, chronic illness or injury leads to emotional problems which leads to stress. The attribute death of a loved one leads to chronic illness or injury. The related connection matrix is given below:

\[ M_2 = \begin{bmatrix} 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 \\ 1 & 0 & 1 & 0 & 0 \end{bmatrix} \]

The directed graph is given by the expert on \( A_3, A_4, A_8, A_{11}, A_{14} \) which forms the class \( C_3 \).

According to this expert the attribute change is interrelated with traumatic event. The attribute fear and uncertainty is related to change and traumatic event. The attribute unrealistic expectations is related to attitudes and perceptions, traumatic event, fear and uncertainty. The attribute attitudes and perceptions is related to change. The related connection matrix is given below:

\[ M_3 = \begin{bmatrix} 0 & 0 & 0 & 1 & 1 \\ 1 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 1 & 0 \end{bmatrix} \]

Now the combined disjoint block connection matrix of the fuzzy cognitive maps \( F \) is given by
\textbf{F =}
\begin{pmatrix}
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 & 0 & 1 & 0 & 0 & 1 \\
0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 1 \\
0 & 0 & 1 & 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 & 1 \\
1 & 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 & 1 & 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 & 1 & 0 & 0 & 0 \\
0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 \\
\end{pmatrix}

Suppose we consider the on state of the attribute working under dangerous conditions and all other states are off the effect of
\begin{align*}
\mathbf{X} &= (1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0) \\
\mathbf{X}F \gamma &= (1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0) = X_1 \text{ (say)} \\
\mathbf{X}_1 F \gamma &= (1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0) = X_2 \text{ (say)} \\
\mathbf{X}_2 F \gamma &= (1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 1 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0 \ 0) = X_3 = X_2
\end{align*}

\(X_2\) is a fixed point of the dynamical system. When the state \(A_1\) is on they felt insecurity in job which leads to stress. Suppose we consider the on state of the attributes fear and uncertainty, death of a loved one, heavy work load, attitudes and perceptions, working long hours, traumatic event, emotional problems and all other nodes are in off state. Now we study the effect of the dynamical system \(F\). Let 
\begin{align*}
\mathbf{T} &= (0 \ 0 \ 1 \ 0 \ 1 \ 1 \ 0 \ 1 \ 0 \ 1 \ 0 \ 0 \ 0 \ 1 \ 1) \\
\mathbf{T}F \gamma&(1 \ 1 \ 0 \ 0 \ 0 \ 1 \ 1 \ 0 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1) = T_1 \\
T_1 F \gamma&(1 \ 1 \ 0 \ 0 \ 0 \ 1 \ 1 \ 0 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1 \ 1) = T_2 \text{ (say)}
\end{align*}

\(T_2\) is a fixed point of the dynamical system. Thus the attributes \(A_3, A_5, A_6, A_8, A_9, A_{10}, A_{14}, A_{15}\) are in the on states, then the attributes fear and uncertainty, unrealistic expectations, death of a loved one, attitudes and perceptions, loss of a job and chronic illness or injury is in the off state and all other attributes become on.

\textbf{CONCLUSION}

We analyzed what are the reasons for stress using CDBFCM model. The limit point of the dynamical system reveals that the attributes \(A_1, A_2, A_6, A_7, A_{10}, A_{11}, A_{13}, A_{14}, A_{15}\) are the main reasons for stress. This means Working under dangerous conditions, divorce, heavy work load, being insecure, working long hours, change, being unhappy in job, traumatic event and emotional problems are all the main reasons for stress.

\textbf{REFERENCES}