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Study on the Impact of Mass Media on the Public in the Indian Society using Fuzzy Relational Maps

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Abstract. Nowadays due to the lifestyle modifications and the latest advancements in the Indian Society, Mass Media has the greatest impact on the public, children, and the young students (Schools and Colleges). This paper analyses the positive as well as negative impact of the mass media on them using Fuzzy Relational Maps (FRMs).
      This paper consists of four sections. Section 1 gives the introduction of the topic. Section 2 is devoted to the description of the problem. Section 3 contains the Fuzzy analysis of the problem using FRM model. In Section 4, the conclusions based on the study are presented.

1. Introduction

A new notion called Fuzzy Relational Maps (FRMs) was introduced by Vasantha et al. [3, 4, 6]. To define a FRM, a domain space and a range space which are disjoint in the sense of concepts is required. In general, the number of elements in the range space need not be equal to the number of elements in the domain space. In FRMs, the very causal associations are divided into two disjoint units, for example the relationship between a teacher and a student or the relationship between a doctor and a patient and so on. Further it is assumed that no intermediate relations exist within the domain element or node and the range space. A similar kind of research has been carried out to examine the living experience of diabetic people by Devadoss et al. [5]. The research was continued in the same aspect to use FRMs and Intuitionistic Fuzzy Sets to analyze Health Problem of Agricultural Labourers by Ghosh and Pal [1]. Also analysis was made on the Problems faced by Experienced Women IT Professionals in Chennai using FRMs by Geethalakshmi et al. [2].
      In this paper, the positive and negative impact of mass media on the people, children, young students (schools and colleges) using the FRM model is discussed.

1.1. Fuzzy Relational Maps (FRMs)
FRM is a directed graph or a map from domain space to range space with concepts and causalities as edges.

Let Domain space = n and Range space = m [m ≠ n]

$R_1, R_2,…,R_m$ be the nodes of Range space.

$R = \{ (x_1, x_2 ,…..,x_m) \mid x_j = 0 \text{ or } 1 \}$ for j = 1,2…. ,m.

If $x_j = 1$ then R_j is on state and if $x_j = 0$ then R_j is off state.

Similarly,

$D_1 , D_2 , …., D_n$ be the nodes of domain space.

$D = \{ (x_1, x_2 ,…..,x_n) \mid x_i = 0 \text{ or } 1 \}$ for i = 1,2…. ,n.

If $x_i = 1$ then D_i is on state and if $x_i = 0$ then D_i is off state.

Formation of FRMs
Let D_i and R_j denote the two nodes of FRM. Let e_{ij} be the weight of the edge D_iR_j (or R_jD_i), then $e_{ij} \in \{0 ,1, -1\}$. The relational matrix E be defined as $E = (e_{ij})$.

a) Instantaneous state vector
Let $A = (a_1 …,a_n)$, $a_i \in \{ 0, 1 \}$ where i = 1,2,..,n. A is called the instantaneous state vector of the domain space and it denotes the on-off position of the nodes at any instant i.e. $a_i = 0$ if a_i is off and $a_i = 1$ if a_i is on for i = 1, 2,.., n for domain space. Similarly, $B = (b_1,…,b_m)$, $b_j \in \{0,1\}$ where j = 1, 2,..,m. B is the instantaneous state vector of the range space. $b_j = 0$ if b_j is off and $b_j = 1$ if b_j is on for j = 1, 2,..,m for range space.

b) Directed Cycle
Let $D_1,…D_n$ and $R_1,…R_m$ be the nodes of an FRM. Let D_iR_j (or $R_j D_i$) be the edges of an FRM where j = 1, 2,…,m and i = 1, 2,..,n. Let the edges form a directed cycle. Then, FRM is said to be cycle if it possesses a directed cycle. Otherwise, it is acyclic.

c) Dynamical system of FRM
An FRM with cycles is said to be an FRM with feedback. When there is feedback in the FRM, i.e. when the causal relations flow through a cycle in revolutionary manner, the FRM is called a dynamical system.

d) Hidden pattern
Let D_iR_j (or $R_j D_i$) where $1 \leq j \leq m$ and $1 \leq i \leq n$ be the edges of an FRM. When D_i (or R_j) is switched on and if causality flows through the edges and if it again causes D_i (or R_j), Then the equilibrium state of this dynamical system is called the hidden pattern.

e) Fixed Point
If the equilibrium state of a dynamical system is a unique state vector then it is called fixed point. Example: -Let us assume a dynamical system by switching on R_1 (or D_1). FRM settles down with R_1 and R_m (or D_1 and D_n) on, i.e. state vector remains as (1,0,…0,1) in R [or (1,0,...,0,1)in D] This state vector is called the fixed point.

f) Limit cycle

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If the FRM settles down with a state vector in the form

$D_1 \rightarrow D_2 \rightarrow \ldots \rightarrow D_i \rightarrow D_1$ (or $R_1 \rightarrow R_2 \rightarrow \ldots \rightarrow R_i \rightarrow R_1$)

This equilibrium is called a limit cycle.

g) **Combined FRM**

Let E_1, $E_2 \ldots E_p$ be the relational matrices of the FRMs. Combined FRM denotes the relational matrix given by $E = E_1 + \ldots + E_p$.

1.2. Methods of determining the hidden pattern

Let $R_1, R_2, \ldots, R_m$ and $D_1, D_2, \ldots, D_n$ be the nodes of FRM with feedback. Let E be the relational matrix. Let us assume that D_1 is switched on i.e. the input is given as vector $A_1 = (1, 0, \ldots, 0)$ in D_1. The data should pass through the relational matrix E. This is done by finding A_1E. Let $A_1E = (r_1, r_2, \ldots, r_m)$. After thresholding and updating the resultant vector, we have $A_1E \in R$. Now let $B = A_1E$. Passing B into E^T by obtaining BE^T. After thresholding and updating the vector, we have $BE^T \in D$. The procedure is repeated till we get a fixed point or limit cycle.

1.3. Examples of FRMs: FRMs are used in the following areas: -
a) Relationship between Doctor and Patient.
b) Relationship between quality condition and academic condition of students
c) Relationship between teacher and poor rural students in City Colleges
d) Study of employee-employer relationship
e) To analyze the Impact of Mass Media on Public in Various Societies.

2. Description and Adoption of FRM model to analyze the Impact of Mass Media on the Public

Data have been collected from the Public using a survey on the impact of Mass Media on them and studied using FRMs. This study is carried out on a sample of 200 persons consisting of five groups (each group containing 40 persons) of school students, college students, working persons, house wives and old age people in and around Ambattur, Chennai with the help of questionnaires. The opinion may vary from person to person based on their age, taste, and various other situations.

This paper analyses these concepts using fuzzy relational maps. The fuzzy concepts are given in the form of attributes and then the relational matrix and solutions are framed.

Domain Space: Attributes related to Mass Media:

M1: National and International News, Weather Forecast, Share Market News
M2: Entertaining programs like Cine Programs, Serials, Chatting programs
M3: Educational Programs like Quiz, Programs related to studies
M4: Sports programs like Cricket, Football, Olympic Games etc.,
M5: Children programs like Cartoons, Short stories, Games etc.,
M6: Advertisements

Range Space: Attributes related to Public:

P1: People relax by watching the programs and also their stress and tension are reduced

P2: Gain Knowledge
P3: Time is wasted
P4: People get addicted to the programs
P5: Children studies get affected
P6: Youngsters (Both boys and girls) are affected
P7: Misguided through Wrong Information
P8: Lots of Information is acquired
P9: Increase in Crime Rate

Now from the Expert's opinion, the Directed Graph is drawn and the relational matrix is framed from it by taking the attributes related to Mass Media i.e M1,M2,…,M6 as the rows and attributes related to the Public i.e P1,P2,….,P9 as the columns.

3. Fuzzy Analysis of the Problem by FRM:

The First Expert is a Public person. Now we will analyze the First Expert 's opinion.
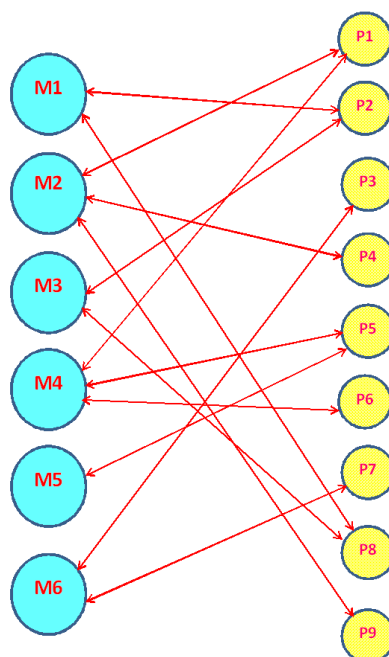## 3.1. First Expert's Opinion (Public person)

Figure 1: Fuzzy Relational Matrix of First Expert's Opinion:

$$A_1 = \begin{bmatrix} 0 & 1 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 0 & 1 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 \end{bmatrix}$$

Now we make the State M1 as on State (National and International News, Weather Forecast, Share Market News) and all other attributes of Domain spaces are to be in off State.

The hidden pattern of the state vector $X_1 = (1\ 0\ 0\ 0\ 0\ 0)$ is obtained by the following method:

$$X_1 = (1\ 0\ 0\ 0\ 0\ 0)$$
$$X_1A_1 \hookrightarrow (0\ 1\ 0\ 0\ 0\ 0\ 0\ 1\ 0) \qquad = Y_1$$
$$Y_1A_1^T \hookrightarrow (1\ 0\ 1\ 0\ 0\ 0) \qquad = X_2$$
$$X_2A_1 \hookrightarrow (0\ 1\ 0\ 0\ 0\ 0\ 0\ 1\ 0) \qquad = Y_1$$
$$Y_1A_1^T \hookrightarrow (1\ 0\ 1\ 0\ 0\ 0) \qquad = X_2$$

(where $\hookrightarrow$ denotes the resultant vector after thresholding and updating)
We obtain the following chain:

$$\mathbf{X_1 \to Y_1 \to X_2 = Y_1 \to X_2} \qquad \textbf{i.e., } \mathbf{X_1} \textbf{ is a fixed point.}$$

According to the first expert (public), if the first state is switched on it turns on the state M3 also. We see that by the programs like National and International News, Weather Forecast, Share Market News and Educational Programs like Quiz, Programs related to studies people gain knowledge as well as information. So, those kinds of programs can be increased.

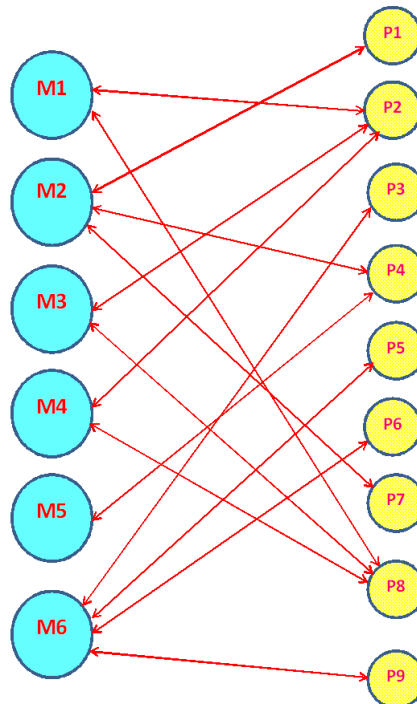## 3.2. Second Expert's Opinion (Media Person)

Figure 2: Fuzzy Relational Matrix of Second Expert's Opinion:

$$A_2 = \begin{bmatrix} 0 & 1 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 & 0 & 0 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 1 & 1 & 0 & 0 & 1 \end{bmatrix}$$

Now we make the State M2 as on State (Entertaining programs like Cine Programs, Serials, and Chatting programs) and all other attributes of Domain spaces are to be in off State.

The hidden pattern of the state vector $X_1 = (\ 0\ 1\ 0\ 0\ 0\ 0\ )$ is obtained by the following method:

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

$X_1 A_2 \hookrightarrow (\ 1\ 0\ 0\ 1\ 0\ 0\ 1\ 0\ 0\ ) \qquad =\ Y_1$

$Y_1 A_2^{T} \hookrightarrow (\ 0\ 1\ 0\ 0\ 1\ 0\ ) \qquad =\ X_2$

$X_2 A_2 \hookrightarrow (\ 1\ 0\ 0\ 1\ 0\ 0\ 1\ 0\ 0\ ) \qquad =\ Y_1$

$Y_1 A_2^{T} \hookrightarrow (\ 0\ 1\ 0\ 0\ 1\ 0\ ) \qquad =\ X_2$

(where $\hookrightarrow$ denotes the resultant vector after thresholding and updating)

We obtain the following chain:

$\mathbf{X_1 \rightarrow Y_1 \rightarrow X_2 = Y_1 \rightarrow X_2}$ **i.e., X_1 is a fixed point.**

According to the Second expert (Media Person), if the Second state is switched on it turns on the state M5 also. We see that by the Entertaining programs like Cine Programs, Serials, and Chatting programs and Children programs like Cartoons, Short stories, Games etc., People relax themselves and their stress and tension are reduced but get addicted to those programs. Also they are misguided through Wrong Information from it. So, People can limit themselves to those kind of programs.

3.3. Third Expert's Opinion (Youngster-Student)
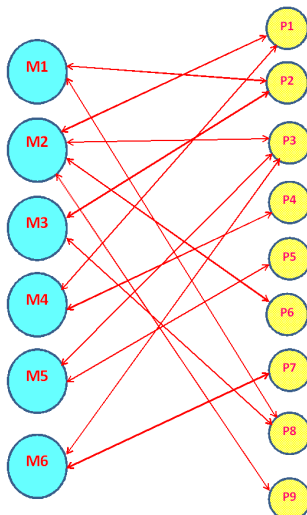

Figure 3: Fuzzy Relational Matrix of Third Expert's Opinion:

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$$A_3 = \begin{bmatrix} 0 & 1 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 0 & 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ 1 & 0 & 0 & 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 & 1 & 0 & 0 \end{bmatrix}$$

Now we make the State M3 as on State (Educational Programs like Quiz, Programs related to studies) and all other attributes of Domain spaces are to be in off State.

The hidden pattern of the state vector $X_1 = (0\ 0\ 1\ 0\ 0\ 0)$ is obtained by the following method:

$X_1 = (0\ 0\ 1\ 0\ 0\ 0)$
$X_1 A_3 \hookrightarrow (0\ 1\ 0\ 0\ 0\ 0\ 0\ 1\ 0) \qquad = Y_1$
$Y_1 A_3^T \hookrightarrow (1\ 0\ 1\ 0\ 0\ 0) \qquad = X_2$
$X_2 A_3 \hookrightarrow (0\ 1\ 0\ 0\ 0\ 0\ 0\ 1\ 0) \qquad = Y_1$
$Y_2 A_1^T \hookrightarrow (1\ 0\ 1\ 0\ 0\ 0) \qquad = X_2$

(where $\hookrightarrow$ denotes the resultant vector after thresholding and updating)
We obtain the following chain:

$X_1 \rightarrow Y_1 \rightarrow X_2 = Y_1 \rightarrow X_2$ **i.e., X_1 is a fixed point.**

According to the Third expert (Youngster-Student), if the third state is switched on it turns on the state M1 also. We see that by the programs like National and International News, Weather Forecast, Share Market News and Educational Programs like Quiz, Programs related to studies people gain knowledge as well as information. So, those kinds of programs can be increased.

Combined FRM:
We take the opinion of the three experts discussed above and find their opinions. The corresponding FRM is given as the sum of the three FRMs A1, A2 and A3.

Let A= A1+ A2+ A3

$$A = \begin{bmatrix} 0 & 3 & 0 & 0 & 0 & 0 & 0 & 3 & 0 \\ 3 & 0 & 1 & 2 & 0 & 1 & 1 & 0 & 2 \\ 0 & 3 & 0 & 0 & 0 & 0 & 0 & 3 & 0 \\ 2 & 1 & 0 & 1 & 1 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 1 & 2 & 0 & 0 & 0 & 0 \\ 0 & 0 & 3 & 0 & 1 & 1 & 2 & 0 & 1 \end{bmatrix}$$

Now we make the State M5 as on State (Children programs like Cartoons, Short stories, Games etc.,) and all other attributes of Domain spaces are to be in off State.

The hidden pattern of the state vector $X_1 = (0\ 0\ 0\ 0\ 1\ 0)$ is obtained by the following method:

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

$X_1A \hookrightarrow (\,0\ 0\ 1\ 1\ 1\ 0\ 0\ 0\ 0\,)$ $=\ Y_1$

$Y_1A^T \hookrightarrow (\,0\ 1\ 0\ 1\ 1\ 1\,)$ $=\ X_2$

$X_2A \hookrightarrow (\,1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\ 1\,)$ $=\ Y_2$

$Y_1A^T \hookrightarrow (\,1\ 1\ 1\ 1\ 1\ 1\,)$ $=\ X_3$

(where $\hookrightarrow$ denotes the resultant vector after thresholding and updating)

We obtain the following chain:

$$\mathbf{X_1 \rightarrow Y_1 \rightarrow X_2 \rightarrow Y_2 \rightarrow X_3 \quad \rightarrow Y_3 = X_3 \rightarrow Y_3 \quad \textbf{i.e., } X_1 \textbf{ is a fixed point.}}$$

A lot of decisions can be made on such fixed points. We see that contradictions are there between public and Media person that is why it is visibly see that all nodes both in the domain space and range space becomes on , at the very advent of seeing the effect of one node of the domain space to be in the on state(i.e. M5). Likewise in case of the domain nodes all nodes come to the on state. Thus we are not able to distinguish or give a nice interpretation of the state vectors.

4. Conclusions

In this paper by using this FRM model we have represented a diagram to show the positive and negative impact of Mass Media on the public in our Indian Society. From the three expert's opinion we come to know that public has to avoid cine programs, serials, sports programs. They can also save their precious time by avoiding advertisements. Media can also be enhanced by increasing Educational and other interesting programs to increase their TRB rating.

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