The interplay between human emotions and beliefs: A study using special mixed fuzzy relational maps (SMFRMs)

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Abstract
Fuzzy relational maps are neuro-fuzzy systems that are useful in approximate reasoning. A problem that is studied by several experts simultaneously using an FRM model choosing different sets of concepts would require an appropriate model to capture the consensus of the experts opinion pertaining to the problem under study. Special Mixed Fuzzy relational map (SMFRM) is identified as an appropriate fuzzy tool to be used in situations where different experts study a problem with different set of concepts. SMFRM is an extension of FRM which is the union of several fuzzy relational maps. In this paper, the model Special Mixed Fuzzy relational map (SMFRM) is used to study the causal relationship between human emotions and beliefs.

Keywords
Emotions, beliefs, Fuzzy, FRM, SMFRM.

AMS Subject Classification
03E72.

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1. Introduction

Emotions have a greater role to play in everyone’s life and a common role in defining the future of humankind [1]. Beliefs are not just perceptions alone, but they are collections of emotional data of the previous experience. The emotional data helps one to recollect the past giving the same kind of experience to every cell of the body to act accordingly. Emotions have the singular role in strengthening, weakening or modifying our beliefs. Here, we try to study the causal relationship between the basic human emotions and beliefs using a fuzzy model approach[2].

2. Description of the problem

Freud believed that emotions and cognition’s are mutually exclusive. But later a number of psycho analytic theorists and scientists have proved that there is an interaction between emotions and beliefs which is constant, continuous and bidirectional. (Schathel, 1959). Almost everyone has a structure of ethical behaviours based on a set of their personal beliefs which guides his/her social behaviour, but a very few are conscious of the details and framework all the time [5,7].

Therefore, it is necessary for an individual to become aware of the framework and details of the belief systems s/he holds onto and the the emotions connected to so that they can have a clear understanding of oneself, others and the world around. Hence, we make an attempt to study the causal
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Table 1. List of emotions

| Sl. No | Aristotle | Darwin | Izard | Ekman | Outley | Plutchik | Turner |
|--------|-----------|--------|-------|-------|--------|----------|--------|
| E1     | Anger     | Anger  | Anger | Anger | Anger  | Anger    | Anger  |
| E2     | ***       | ***    | ***   | ***   | ***    | ***      | ***    |
| E3     | ***       | ***    | ***   | ***   | ***    | Anx      | ***    |
| E4     | Calm      | ***    | ***   | ***   | ***    | ***      | ***    |
| E5     | Confidence| ***    | ***   | ***   | ***    | ***      | ***    |
| E6     | Contempt  | ***    | Contempt | *** | ***    | ***      | ***    |
| E7     | ***       | Disgust| Disgust| Disgust| Disgust| Disgust  | Disgust |
| E8     | ***       | ***    | Distress | *** | ***    | ***      | ***    |
| E9     | Emulation | ***    | ***   | ***   | ***    | ***      | ***    |
| E10    | Enmity    | ***    | ***   | ***   | ***    | ***      | ***    |
| E11    | Envy      | ***    | ***   | ***   | ***    | ***      | ***    |
| E12    | Fear      | Fear   | Fear  | Fear  | Fear   | Fear     | Fear   |
| E13    | Friendship| ***    | ***   | ***   | ***    | ***      | ***    |
| E14    | ***       | Guilt  | ***   | ***   | ***    | ***      | ***    |
| E15    | ***       | Happiness| *** | ***    | Happiness| *** | Happiness |
| E16    | Indignation| *** | ***   | ***   | ***    | ***      | ***    |
| E17    | ***       | Interest| ***  | ***   | ***    | ***      | ***    |
| E18    | ***       | Joy    | Joy   | Joy   | Joy    | Joy      | Joy    |
| E19    | Kindness  | ***    | ***   | ***   | ***    | ***      | ***    |
| E20    | Pity      | ***    | ***   | ***   | ***    | ***      | ***    |
| E21    | ***       | Sadness| ***   | Sadness| Sadness| Sadness  | Sadness |
| E22    | Shame     | ***    | Shame | ***   | ***    | ***      | ***    |
| E23    | Shamelessness| *** | ***   | ***   | ***    | ***      | ***    |
| E24    | ***       | Surprise| Surprise | *** | ***    | Surprise  | ***    |
| E25    | ***       | ***    | ***   | ***   | ***    | Trust    | ***    |

Table 2. List of Primary Beliefs

| Sl. No | Domains   | Labels | Core beliefs |
|--------|-----------|--------|--------------|
| 1      | Survival  | B1     | I am abandoned |
|        |           | B2     | I can survive |
| 2      | Responsibility| B3   | I am worthless |
|        |           | B4     | I am good enough |
| 3      | Vulnerability| B5    | I am helpless |
|        |           | B6     | I can protect myself |
| 4      | Judgement  | B7     | I cannot think for myself |
|        |           | B8     | I trust my judgement |
| 5      | Connection| B9     | I cannot trust others |
|        |           | B10    | I am connected |

relationship between core beliefs and basic emotions using the information received from different experts.

2.1 Basic emotions

The Aristotlean texts, the Nichomachean Ethics and the Rhetoric, give a list of core emotions. The Nichomachean Ethics lists 11 emotions while the Rhetoric serves a full list of 14 emotions. Descartes and Darwin listed 6 emotions while Pluthick, Ekman, Izdar and Turner proposed various number of basic emotions. Many of the scholars have little agreement over these lists of basic emotions. In this regard Solomon expressed that “the quest for basic emotions should be understood and pursued in such a way as to capture the richness and variety of human existence”. To study the causal relationship between human emotions and beliefs we have considered seven different lists of basic emotions as different experts wanted to work with different sets of basic emotions [8-10].

2.2 Core beliefs

Beliefs are antecedents of emotions. Similarly, emotions also influence beliefs. Hence it is very clear that there is a causal relationship between beliefs and emotions. Here, we consider five specific belief domains, namely survival, responsibility, vulnerability, judgment and connectedness. These were identified based on the literature available on this topic and the opinions of the experts that they could be very much involved in inducing the basic emotions in a person. For each domain there could be any number of core beliefs associated, but we consider only one positive and negative emotion corresponding to each domain. However, this is not an exhaustive list of domains and beliefs [6].

3. Description of the Model

In this paper, the model Special Mixed Fuzzy relational map (SMFRM) is used to study the causal relationship be-
tween human emotions and beliefs. This fuzzy model was introduced by W.B. Vasanthas Kandasamy et al in their book Special Matrices for Social Scientists in 2002. Special Mixed Fuzzy relational maps (SMFRMs) are the union of fuzzy relational maps.

Suppose there is a problem which is studied by several experts simultaneously. If the experts agree to work with FRM model on the given problem but at the same time they want to have their freedom of choosing the set of concepts according to their wish, then Special Mixed Fuzzy relational map (SMFRM) is the appropriate tool to study the different FRMs provided by each expert independently [15-17,20].

Assume that ‘m’ number of experts are working on a problem under consideration. Let the ith expert choose to work with ti number of domain attributes of the FRM which forms the rows of the relational matrix and with si number of range attributes of the FRM which forms the columns of the relational matrix. Let Mi denote the connection relational matrix given by the ith expert which is a ti × si fuzzy matrix with entries from the set {−1,0,1}. The same procedure is adopted by the ‘m’ experts. Therefore, for i = 1, 2,……, m, we get ‘m’ number of relational matrices that are of different orders.

The SMFRM model is defined to be the model represented by the special fuzzy mixed rectangular matrix M = M1 ∪ M2 ∪ ……….. ∪ Mm where each M_i is a relational matrix of different orders provided by each expert. Let Ds and Rs denote the special domain space and special range space respectively then the special dynamical system of the SMFRM comprises of \{M = M1 ∪ M2 ∪ ……….. ∪ Mm, Ds, Rs\}.

4. Analysis of the problem

In our study of relationship between emotions and beliefs, the experts worked with different number of attributes resulting in different FRMs. Since we wanted to study all of the FRMs simultaneously we adopted the fuzzy model Special Mixed Fuzzy Relational Maps (SMFRMs). The special domain space consists of 10 core beliefs and the special range space consists of 25 basic emotions [8,11,12]. There were 7 experts who worked with 7 different sets of basic emotions based on different theories of emotions [4,13,14]. Hence we had 7 rectangular fuzzy relational matrices. The special mixed fuzzy relational matrix of the dynamical system is given by M = M1 ∪ M2 ∪ M3 ∪ M4 ∪ M5 ∪ M6 ∪ M7 where each Mi is a relational matrix on the relational map provided by each expert.

5. Method of Finding the Hidden Pattern

Let

\[ X = X_1 \cup X_2 \cup \ldots \ldots \cup X_m \in D_s \]

be the special fuzzy mixed row vector given as the input vector by all the m experts. To find the effect of X ∈ Ds on the special dynamical system M.

\[ X \circ M = (X_1 \cup X_2 \cup \ldots \ldots \cup X_m) \circ (M_1 \cup M_2 \cup \ldots \ldots \cup M_m) \]

\[ = X_1 \circ M_1 \cup X_2 \circ M_2 \cup \ldots \ldots \cup X_m \circ M_m \]

\[ = Y_1 \cup Y_2 \cup \ldots \ldots \cup Y_m \]

This resultant vector Y' may or may not belong to Rs. Hence we threshold Y' to Y = Y_1 ∪ Y_2 ∪ ……….. ∪ Y_m such that Y ∈ Rs. Then we calculate

\[ Y \circ M' = (Y_1 \cup Y_2 \cup \ldots \ldots \cup Y_m) \circ (M'_1 \cup M'_2 \cup \ldots \ldots \cup M'_m) \]

\[ = Y_1 \circ M'_1 \cup Y_2 \circ M'_2 \cup \ldots \ldots \cup Y_m \circ M'_m \]

\[ = Z'_1 \cup Z'_2 \cup \ldots \ldots \cup Z'_m \]

This resultant vector Z' may or may not belong to Rs. Hence we update and threshold Z' to Z = Z_1 ∪ Z_2 ∪ ……….. ∪ Z_m such that Z ∈ Rs. We find Z ⊙ M and so on until we arrive at a special point or special limit cycle which is a special binary pair (T, S) with T and S being special fuzzy mixed row vectors where T ∈ Ds and S ∈ Rs [20-22].

When the input vector is (1000000000) the fixed point obtained is (1110101010101, 10011111101010101, 1110101010101, 1111111111111111010101010, 11011010101010101, 11011010101010101, 11111010101010101, 11111010101010101) Similarly for other input vectors the fixed points were found out.

6. Discussion and results

From the fixed point we infer that the belief B4 (I am good enough) turns on two negative emotions E1 (Anger) & E8 (Distress) and two negative beliefs B1 (I am abandoned) & B5 (I am helpless). This suggests B4 is not strong enough to control these negative emotions and beliefs that may flare up in different contexts [18,19,23].

As excepted positive beliefs influence positive emotions except for the belief B6 (I can protect myself), which turns off all the emotions both positive and negative. This implies that the mindset to hold oneself responsible for their protection does not create any agitation in their emotions.

We see the pattern transposed with one particular belief B8 (I trust my judgement). The possible reason for this could be the absence of surprise in the list which is present in other lists, while anxiety is present in this list alone. It appears as though anxiety and surprise play the complementary roles. When anxiety is under control it can turn on B8, a positive belief. All the negative beliefs switch ON all the negative emotions as expected. The emotion E2 (Anticipation) is influenced by both positive and negative emotions. And our assumptions here is that this emotion creates stress in the individual by influencing B7 (I cannot think for myself).
7. Conclusion

According to Shoemaker, “Our emotions create our real selves. The emotions we have make us the persons we are” (2003, p.24). Schachtel (1959) says, “I believe there is no action without affect (emotion or drive)” (1959, p.20). Schathel also attributed that emotions play a great role in communication and thus have a significant influence in social interactions [3]. The affective cognitive structures consist of a dynamic and relatively stable relationship between an emotion and certain cognitive processes such as ideas and beliefs. (Human emotions, Izard). For example, if a child is rewarded and made happy for its skills and performance, S/he may develop superiority feelings about self and others and these feelings get stored in memory and formulate as beliefs in course of time. These beliefs whenever accessed produce the same feeling and activate the same emotion that acts as a stimulant to take action at the present moment in time. Beliefs are vague, abstract and very much hard to grasp and hence always out of reach. But there is a specific emotion underneath every belief. Emotions make the beliefs tangible and felt in the body. With the help of emotions, we can locate our difficult beliefs, confront them and change them for better. All human beings need to believe in themselves and back themselves in order to be Champions in personal and public life.

The following are the inferred conclusions we have arrived at after the study:

1. Switching ON or OFF of the beliefs is independent on the cardinality of basic emotions sets. In every list of basic emotions, the number of negative emotions dominate the number of positive emotions.

2. The temporary consideration attached to an emotion can turn into a long-term belief when an emotion turns into a ‘sentiment’ which becomes an unconscious influence of one’s personality and life.

3. When one has to choose between two beliefs, the belief which is attached with more intense emotion always overrides and that becomes the truth and the reality.

4. The theory of law of attraction proposes that the beliefs with stronger emotions are surely to become reality. This theory also says that even when we desire something positive but experience negative feelings such as fear or envy, the opposite of what is desired is realised.

5. When there is a need to persuade an individual or a group, the corresponding beliefs need to be embedded with an appropriate measure of emotion. The teachers who make an emotional connection with their students before each class are successful in their profession and they can affect the lives of their students effectively for a reasonably longer duration.

6. Attaching emotional feelings to positive and constructive beliefs either consciously or from the past experiences helps an individual in installing productive new beliefs and achieving desired changes in life. For instance, recollecting the emotional experience of receiving an appreciation for scoring high marks would motivate a person to do better later on in life.

7. Continuous emotional attacks can turn life into a disaster. In the long run one may lose the sight of distinction between the belief and the emotion associated with it. Activities such as journaling or talking about them would enable one to verbalise their emotions and thus be helpful in getting clear about the influencing beliefs. (Frijda)

8. Mindfulness, that is a continuous awareness of emotions experienced in the body would help in detaching the undue measures of emotions attached to wrong or negative beliefs and eventually get out of the clutches of illogical beliefs. Similarly it helps in strengthening a particular positive belief and in creating a new beneficial belief.

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ISSN(P):2319 – 3786
Malaya Journal of Matematik
ISSN(O):2321 – 5666
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