RESEARCH ARTICLE OPEN ACCESS

A Study on Fuzzy Matrix in Yoga on Obesity

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ABSTRACT:
A fuzzy matrix is a matrix with elements having values in the closed interval **[0,1]**. Fuzzy Matrices occur in the modeling of various fuzzy systems, with **"Max average composition"** rule arising from fuzzy set theory. In this paper some sufficient conditions for convergence under "max average" composition of the fuzzy matrix and of a fuzzy state process are established.An occurrence relation **R** and conformability relation **S** are determined from expert medical documentation and observation of the related patient with obesity. Now yoga is being applied as a theropy around the world. It has observed that yoga is very beneficial for obese people to remain healthy and also to reduce the weight. As we find yoga brings as very positive change in attitude and behavior and increases mental capacities.

Key Words: Fuzzy matrix, max average composition, obey sity, Body Mass index .

Date of Submission: 22 -07-2017 Date of acceptance: 10-08-2017

I. INTRODUCTION

Medicine is one field in which the workable of fuzzy set theory was recognized quite early, in the mid – 1970s within this field, it is the uncertainty found in the process of diagnosis of disease that has most continually been the focus of application of fuzzy set theory.

In this section, we examine some basic issues of these applications. With the increased volume of information available to medico from new medical technologies the process of classifying different sets of symptoms under a single name and determining appropriate healing actions becomes increasingly difficult. A single disease may luminous itself quite differently in different patients and at different diseases stage Furthermore, a single symptom may be reflective of several different diseases, and the presence of several diseases in a single patient may disrupt the expected symptom pattern of any one of them. The best and most useful rendering of disease entities often use linguistic terms that are irredulibly vague.

Although medical knowledge concerning the symptom- disease relationship regarding one source of imprecision and uncertainty in the diagnostic process, the knowledge concerning the state of the patient constitutes another. The medico generally gather knowledge about the patient from the past history, physical examination, laboratory test results and other investigative operations such as X- rays and ultrasonic. The measurements provided by laboratory test are often of limited perfections, and the exact marginal between normal and pathological is often unclear.

The fuzzy set structure has been utilized in several different near to modeling the diagnostic process. In the approach formulated by sanchez (1979), the medico's medical knowledge is represented as a fuzzy relation between symptoms and diseases. Thus, given the fuzzy set A of the symptoms observed in the patient and the fuzzy relation R representing the medical knowledge that relates the symptoms in set S to B of the possible diseases of the patient can be drive by means of the piece rule of determination

$$B = \max_{s \in S}$$

Or

$$B(d) = \max_{s \in S} [\text{average } A(S), R(S,d)]$$

For each $d \in D$

Obesity is fast becoming the developed world's versed health problem. Adult obesity rutes have almost quadrupled, become four times as great over the cost 35 years. They are at least two to three stone overweight and putting their health at grave risk. Most of people eat most food then they require, and much of it is higher in calories that the human body was originally designed to cope with. Fast food, high calorie snacks, cold drink and large

portion of meals given more energy than required. Thus obesity is generated in the body.

II. PRELIMINARIES

A summary of basic definitions is given,

Definition (2.1) :

A set is a well defined collection of objects

Definition (2.2):

If **X** is a universe of discourse and **x** be any particular element of **X**, then a fuzzy set $\tilde{A}$ defined on **X** any be written as a collection of ordered pairs

$$\tilde{A} = \{ x, \mu_{\tilde{A}}(x) : x \in X \}$$

Where, each Pair $(x, \mu_{\tilde{A}}(x))$, is called a singleton.

Definition (2.3) :

Let $\mathbf{F_{m\,n}}$ denote the set of all **mxn** Matrices over **F**, if m = n, in short, we write $\mathbf{F_n}$ Elements of $\mathbf{F_{m\,n}}$ are called as membership value matrices, binary fuzzy relation matrices (or) in short, fuzzy matrices

Fuzzy matrices, Boolean matrices over the Boolean algebra {0,1} are special types of fuzzy matrices.

Definition (2.4) :

Let $A = (a_{ij}) \in F_{mn}$ and $B = (b_{ij}) \in F_{mn}$. Then the matrix

A + B = (sup { a_{ij},b_{ij}}) ϵ F_{mn} called the sum of **A** and **B.**

Definition (2.5):

BMI

"BMI is a person's weight in kilogram (kg) divided by his or her height in meters squared. The national institute of health (NIH) now defines normal Weight, overweight and obesity A Very muscular person might have a high BMI without health risks.

Definition (2.6):

A complement of a fuzzy set $\tilde{A}$ of a set X is denoted by $\tilde{A}$, or $\tilde{A}^c$ or $\overline{\tilde{A}}$ and is defined as

$$\tilde{A}' = \tilde{A}^c = \overline{\tilde{A}} = 1 - \mu_{\tilde{A}}(x)$$

Definition (2.7):

The membership function values need no always be described by discrete values. Sometimes, these turn out to be as described by a continuous function.

The most commonly used range of values of membership functions is the unit interval [0,1]. In this case, each membership function maps elements of a given universal set X, which is always a crisp set, into real number in [0,1].

The following two types of notations commonly used to denote the membership function

(i) The membership function of a fuzzy set $\tilde{A}$ is denoted by $\mu_{\tilde{A}}$ i.e.,

$$\mu_{\tilde{A}} : X \rightarrow [0,1]$$

(ii) The membership function of a fuzzy set $\tilde{A}$ has the following form

$$\tilde{A} : X \rightarrow [0,1]$$

Definition (2.8):

The Compliment of a fuzzy matrix $\tilde{A}_{ij}$ of a set X is denoted by $\tilde{A}'_{ij}$ or $\tilde{A}^c_{ij}$ or $\overline{\tilde{A}_{ij}}$ and is defined as $\tilde{A}'_{ij} = \tilde{A}^c_{ij} = \overline{\tilde{A}} = \mu_{\tilde{A}_{ij}}(x)$

Definition (2.9):

Let $\tilde{R}_1$ and $\tilde{R}_2$ and be two fuzzy relations on **(X,Y)** and **(Y,Z)** respectively. Then the max-avg composition is denoted as $\tilde{R}_1 \underset{av}{\circ} \tilde{R}_2$ is defined as

$$\tilde{R}_1 \underset{av}{\circ} \tilde{R}_2(x,z) = \{ \{(x,z), \frac{1}{2} \max z \in Z \{ \mu_{\tilde{R}_1}(x,y) + \mu_{\tilde{R}_2}(y,z) \} \}, \forall x \in x, y \in y, z \in z$$

iii ALGORITHM

Case (i) : Input the fuzzy Matrix $\tilde{R}$ refers to height and weight

Case (ii) : Input the fuzzy Matrix $\tilde{S}$ refers to height and BMI.

Case (iii) : Complete the corresponding Matrices $\tilde{R}$ and $\tilde{S}$

Case (iv) : Compute

$$\tilde{T} = \tilde{R} \underset{av}{\circ} \tilde{S}$$

Case (v) : Compute

$$\underset{av}{\tilde{T}} = \frac{1}{2}(Max(\mu_{\tilde{R}} + \mu_{\tilde{S}}))$$

Step : 1 :

In put the fuzzy Matrix

$\tilde{R}$ =

	H	W
P_1	0.1	0.39
P_2	0.1	0.51
P_3	0.1	0.65
P_4	0.1	0.45
P_5	0.1	0.76
P_6	0.1	0.86

H- Heights and W-Weights in after yoga.

Step :2 :-

Input the fuzzy Matrix

$\tilde{S}$ =

	P_1	P_2	P_3	P_4	P_5	P_6
H	0.1	0.1	0.1	0.1	0.1	0.1
BMI	0.21	0.24	0.26	0.22	0.26	0.27

H- Height and BMI-Body Mass Index in after yoga.

Step 3 :

Compute the corresponding Matrices $\tilde{R}$ and $\tilde{S}$

$$\tilde{T} = \mu_{\tilde{R}} \underset{Av}{\circ} \mu_{\tilde{S}} = \frac{1}{2}\{\max(\mu_{\tilde{R}} \underset{av}{\circ} \mu_{\tilde{S}})\}$$

$= \frac{1}{2}$

	H	W	BMI
P_1	max(0.2,0.6)	max(0.2,0.6)	max(0.2,0.6)
P_2	max(0.2,0.7)	max(0.2.,0.7)	max (0.2,1.7)
P_3	max(0.2,0.8)	max(0.2,0.8)	max(0.2,0.9)
P_4	max(0.2,0.6)	max(0.2,0.7)	max(0.2,0.7)
P_5	max(0.2,0.9)	max(0.2,1.0)	max(0.2,1.0)
P_6	max(0.2,1.0)	max(0.2,1.1)	max(0.2,1.1)

III. CASE STUDY

First symptom of obesity is increase in weight ; body loses its shape due to accumulation of fats in various parts of body . After Practicing yoga their range of movement increased metabolic rate is improved. Fat mobilized and muscle became stronger. Both body and mind became stable.

$$\tilde{T} = \frac{1}{2}$$

	H	W	BMI
P_1	0.6	0.6	0.6
P_2	0.7	0.7	1.7
P_3	0.8	0.8	0.9
P_4	0.6	0.7	0.7
P_5	0.9	1.0	1.0
P_6	1.0	1.1	1.1

Step 4 :-

$$\tilde{T} = \mu_{\tilde{R}} \circ_{av} \mu_{\tilde{S}} =$$

	H	W	BMI
P_1	0.3	0.3	0.3
P_2	0.3	0.3	0.8
P_3	0.4	0.4	0.4
P_4	0.3	0.4	0.3
P_5	0.4	0.5	0.5
P_6	0.5	0.7	0.6

It is clear from the above matrix the patient $\mathbf{P_2}$ is suffering from overweight. This is obese Class III (Extremely high weight)

This study indicates to apply yoga for a long time with patience and regularly so that obesity can receive more advantage at various level of personality.

IV. CONCLUSION

Application of fuzzy set theory in medicine are by no means restricted to medical diagnosis, other applications involve for example, fuzzy controller for various medical devices and fuzzy decision making for determining appropriate therapies. Obesity is big social problem which leads to many psychosomatic disorders or disease. It is noticed that obesity have many other problems and complications at emotional and psychological levels. At the conclusion, it can be asserted that intervened yogic program give a very good result in weight reduction and positive promotion of health.

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International Journal of Engineering Research and Applications (IJERA) is **UGC approved** Journal with Sl. No. 4525, Journal no. 47088. Indexed in Cross Ref, Index Copernicus (ICV 80.82), NASA, Ads, Researcher Id Thomson Reuters, DOAJ.

T. Geetha " A Study on Fuzzy Matrix in Yoga on Obesity." International Journal of Engineering Research and Applications (IJERA) 7.8 (2017): 52-55