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Fuzzy Soft Matrices Applied In Yoga On Hemorrhoid

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Abstract :*In this paper, we define fuzzy soft matrices and their basic properties. We then define fuzzy soft matrices which are matrix representation of the fuzzy soft sets. The purpose of this paper is to define different hyper of matrices in fuzzy soft set theory, we have introduced here some new operations on these matrices and discussed here all these definitions and operations by appropriate example.In this work, we define soft matrices and their operations which are more functional to make theoretical studies in the soft set theory. We then define products of soft matrices and their properties. We finally construction on soft max – min decision making method which can be successfully applied to the problems that contain uncertainties.*
Key Words :*Soft set, fuzzy soft set (FSS), Fuzzy Soft Matrices (FSM), Fuzzy Soft Complement Matrices, Null Set, Fuzzy Soft Class, Hemorrhoids .*

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I. Introduction

Molodtsov [1] also described the concept of "Soft Set Theory" having Parameterizations tools for dealing with uncertainties. Researchers on soft set theory have received much attention in recent years. Magi and Roy [3,4] first introduced soft set into decision making problems. Maji et al., [2] introduced the concept of fuzzy soft sets by combining soft sets and fuzzy sets. Cagman and Enginoglu [5] defined soft matrices which were a matrix representation of the soft sets and constructed a soft max – min decision making method. Cagman and Enginoglue [6] defined fuzzy soft matrices and constructed a decision making problem. Borah et al.,[7] extended fuzzy soft matrix theory and its application. Maji and Roy[8] presented a novel method of object from an imprecise multi – observer data to deal with decision making based on fuzzy soft sets.

Yoga can be very beneficial in relieving bowel troubles. As a first line of defense, it might be useful to focus asanas on the mid – section. Yoga helps in the removal of the toxins in the body which can give a free and active feeling to the body and once the toxins are out from the body. It helps to restore the normal balance of the body and provide freedom from the pain caused due to piles. Piles may cause back pain in several individuals because of its critical positions in the body. Yoga exercises can helps to greatly in the treatment of piles and the back pain. One of the key elements of the yogi lifestyle is strict vegetarianism. Various asunas can be used for the treatment of piles and a few which have guaranteed results like sarvangasana, tudasan, surya namaskar and a few quite challenging poses like shirshsana.

II. Preliminaries

Definition (2.1) :
Soft Set :

Let U be an Initial universe set and E be a set of Parameters. Let P(U) denotes the power set of U. Let A $\subseteq$ E. A pair (F_A,E) is called a soft set over U, Where F_A is a mapping given by,

$$F_A : \mathrm{A} \to \mathrm{P(U)}$$

In other words, a soft set over U is a parameterized family of subsets of the universe U.

Definition (2.2) :
Fuzzy Soft Set

Let U be an initial universe, E be the set of all parameter and A $\subseteq$ E. A pair (F,A) is called a fuzzy soft set over U where $F : \mathrm{A} \to \mathrm{P(U)}$ is a mapping from A into P(U), Where P(U) denotes the collection of all subsets of U.

Definition (2.3) :

Fuzzy soft Class :

Let U be an initial universe set and E be the set of attributes. Then the Pair (U,E) denotes the collection of all fuzzy soft sets on U with attributes from E and is called a fuzzy soft class.

Definition (2.4):
Fuzzy Soft Sub Set :
For two fuzzy sets (F_A,E) and (G_B,E) Over a common universe U, we have (F_A,E) $\subseteq$ (G_B,E) if $A \subset B$ and for all $e \in A, F_A(e)$ is a fuzzy soft subset of G_B(e), i.e., (F_A,E) is a fuzzy soft subset of (G_B,E)

Definition (2.5):
Fuzzy soft complement set :
The complement of fuzzy soft sets (F_A,E) denoted by (F_A,E) is defined by $(F_A, E)^\circ = (F_A{}^\circ, E)$, where $F_A{}^\circ : E \rightarrow I^U$ is a mapping given by $F_A{}^\circ(e) = [A(e)]^\circ$, *for* all $e \in E$

Definition (2.6):
Fuzzy Soft Null Set :

A fuzzy Soft set (F_A,E) over U is said to be null fuzzy soft set with respect to the parameter denoted by $\varnothing$, if $F_A(e) = \varnothing$ for all $e \in E$

Definition (2.7):
Fuzzy Soft Matrix :

Let U = {u_1,u_2,u_3,u_4,….um} be the universal set and E be the set of parameters given by E= {1,e_1,e_2,…e_n}. Then the fuzzy soft set (F_A,E) can be expressed in matrix from as $\tilde{A} = [a_{ij}{}^A]_{mxn}$ or simply by $[a_{ij}{}^A]$, I = 1,2,3…. m; j = 1,2,…..n and $[a_{ij}{}^A] = [(\mu_{ij}{}^A, \gamma_{ij}{}^A)]$; where $\mu_{ij}{}^A$ and $\gamma_{ij}{}^A$ represent the fuzzy membership function and fuzzy reference function U in the fuzzy set $F_A(e_j)$ so that $\delta_{ij} = \mu_{ij}{}^A - \gamma_{ij}{}^A$ gives the fuzzy membership value of U. We shall identify a fuzzy soft set with its fuzzy soft matrix and use these two concepts interchangeable. The set of all mxn fuzzy soft matrices over U will be denoted by FSM_{mxn}. For usual fuzzy sets with fuzzy reference function 0, it is obvious to see that $a_{ij}{}^A = [(\mu_{ij}{}^A, 0)]$ for all i,j.

Definition (2.8) :
Membership value function :
The membership value matrix corresponding to the matrix $\tilde{A}$ as $MV(\tilde{A}) = [\delta_{ij}{}^A]_{mxn}$ where $\delta ij = \mu_{ij}{}^A - \gamma_{ij}{}^A$ for all I = 1,2,3,… m, j = 1,2,3,…. n where $\mu_{ij}{}^A$ *and* $\gamma_{ij}{}^A$ represent the fuzzy membership function and fuzzy reference function respectively of U in the fuzzy set $F_A(e_j)$.

Definition (2.9) :
Fuzzy Soft Complement Matrix :

Let $\tilde{A} = \left[a_{ij}{}^A\right]_{mxn}$, then complement of $\tilde{A}$ is denoted by $\tilde{A}^\circ = \left[(c_{ij})\right]$ where $c_{ij} = 1 - a_{ij}{}^A$ for all i an j.

Definition (2.10) :
Addition of Fuzzy Soft Matrices :

Let U = {u_1,u_2,u_3,u_4,…….u_m} be the universal set and E be the set of parameters given by E = {e_l,e_2,…..e_n}. Let the set of all mxn fuzzy soft matrices over U be FSM $_{mxn}$. Let $\tilde{A}, \tilde{B} \in FSM_{mxn}$, where $\tilde{A} = \left[a_{ij}{}^A\right]_{mxn}, \left[a_{ij}{}^A\right] = \left[(\mu_{ij}{}^A, \gamma_{ij}{}^A\right]$; *and* $B = \left[b_{ij}{}^B\right]_{mxn}, \left[b_{ij}\right]^B = \left[(\mu_{ij}{}^B, \gamma_{ij}{}^B)\right]$ to avoid degemerate case we assume that min $\left[\left(\mu_{ij}{}^B, \mu_{ij}{}^B\right)\right] \geq Max\left[\left(\gamma_{ij}{}^A, \gamma_{ij}{}^A\right)\right]$ for all i and j we defined the operation 'additon (+)' between $\tilde{A}$ and $\tilde{B}$ as $\tilde{A} + \tilde{B} = \tilde{C}$, where $\tilde{c} = \left[c_{ij}^{\ c}\right]_{mxn}, c_{ij}^{\ c} = (\max(\mu_{ij}^{\ A}, \mu_{ij}^{\ B}), \min(\gamma_{ij}^{\ A}, \gamma_{ij}^{\ B}),$ and "Subtraction (-)" between $\tilde{A}$ and $\tilde{B}$ as $\tilde{A} - \tilde{B} = \tilde{C}, where\ C = (c_{ij}^{\ c})_{mxn}, c_{ij}^{\ c} = (\min(\mu_{ij}^{\ B}, \mu_{ij}^{\ A}),\ \max(\gamma_{ij}^{\ B}, \gamma_{ij}^{\ A}))$

Definition (2.11)
Score Matrix :

Let $\tilde{A}, \tilde{B} \in FSM_{mxn}$. Let the corresponding membership value matrices be $MV(\tilde{A}) = \left[\delta_{ij}^{\ A}\right]_{mxn}$ and $MV(\tilde{B}) = \left[\delta_{ij}^{\ B}\right]_{mxn}$, i = 1,2,3,…..m; j = 1,2,3,…..n. Then the Score matrix $S_{(A,B)}$ would be defined as $S_{(A,B)} = \left[\rho_{ij}\right] mxn$ Where $\rho_{ij} = \delta_{ij}^{\ A} - \delta_{ij}^{\ B}$

Definition (2.12) :
Total Score Matrix :

Let $\tilde{A}, \tilde{B} \in FSM_{mxn}$. Let the Corresponding membership Value Matrix be $MV(\tilde{A}) = [\delta_{ij}^{\ B}]_{mxn}$ respectively and the score matrix be $\delta(A,B) = \delta_{ijA} - \delta_{ijB}$ i = 1,2,3,.....m, j = 1,2,3,.....n Then the total score for each u, in U would be calculated by the formula $\delta = \sum \left[\delta_{ij}^{\ A} - \delta_{ij}^{\ B}\right] = \sum \left[(\mu_{ij}^{\ A}, \gamma_{ij}^{\ A}) - (\mu_{ij}^{\ B}, \gamma_{ij}^{\ B})\right]$

Definition (2.13) :

Hemorrhoids, also called pices, are vascular structures in the anal canal. In the normal state, they are cushions that help with stool control. They become a disease when swollen or in flamed; the unqualified term hemorrhoid" is often used to refer to the disease. The sign and symptoms of hemorrhoids depend on the type present. Internal hemorrhoids often result in painless. Bright red rectal bleeding when defecating External hemorrhoids often result in pain and swelling in the area of the anus. If bleeding occurs it is usually darker. Symptoms frequently get better after a few days. A skin tag may remain after the healing of an external hemorrhoid.

III. Algorithm :

1. Input the fuzzy soft Matrices (F_A,E) and (G_B,E) Also write the fuzzy soft Matrices $\tilde{A}$ *and* $\tilde{B}$ commensurate to (F_A,E) and (G_B,E) respectively.
2. Write the fuzzy soft matrices $(F_A, E)^\circ$ and $(G_B,E)^\circ$ Also write the fuzzy soft matrices $\tilde{A}$ and $\tilde{B}$ corresponding to $(F_A, E)^\circ$ and $(G_B,E)^\circ$ respectively.
3. Compute $\tilde{A} - \tilde{B}$ and $MV(\tilde{A} - \tilde{B})$
4. Compute $\tilde{A}^\circ - \tilde{B}^\circ$ and $MV(\tilde{A}^\circ - \tilde{B}^\circ)$
5. Compute the score matrix $S_{\left((\tilde{A}-\tilde{B}),(\tilde{A}^\circ-\tilde{B}^\circ)\right)}$
6. Compute the total score S_i for Ruch u_i in v.
7. Find $S_k = \max(S_i)$
8. If S_k has more than one value, then go to step (1) and repeat the process by reassessing the parameters.

IV. Case Study :

Consider 4 Patients Saritha, Balan, Velu, Vijaya are denoted by the set P ={Saritha, Balan, Velu, Vijaya} and the set of symptoms S = {Painless bleeding, itching or irritation, painful lump, swelling around your anus} . Let the set of disease D = {Internal Hemorrhoids, Prolapsed Hemorrhoids, External hemorrhoids, Thrombosed hemorrhoids}

Yoga Therapy for Hemorrhoids yoga therapy (PILES). Yoga is beneficial to either treat to prevent hemorrohoids. It can both alleviate the discomfort or help prevent it from forming Hemorrhoids, also known as piles, are swellings that develop from the lining of the anus and lower rectum.

Step 1 :

$(F_A,E) = (F_A,e_1) = \{(u_1,0.6,0.0),(u_2,0.8,0.0)(u_3,0.5,0.0)(u_4,0.3,0.0)\}$
$(F_A,e_2) = \{(u_1,0.9,0.0),(u_2,0.7,0.0),(u_3,0.4,0.0),(u_4,0.7,0.0)\}$
$(F_A,e_3) =\{(u_1,0.6,0.0),(u_2,0.8,0.0),(u_3,0.6,0.0),(u_4,0.3,0.0)\}$
$(F_A,e_4) = \{(u_1,0.8,0.0),(u_2,0.2,0.0)(u_3,0.4,0.0),(u_4,0.5,0.0)\}$
$(G_B,E) = \{G_Be_1\} = \{(u_1,0.8,0.0)(u_2,0.9,0.0)(u_3,0.6,0.0)(u_4,0.3,0.0)\}$
$(G_B,e_2) = \{(u_1,0.2,0.0);(u_2,0.4,0.0)(u_3,0.5,0.0)(u_4,0.7,0.0)\}$
$(G_B,e_3) = \{(u_1,0.9,0.0);(u_2,0.7,0.0)(u_3,0.6,0.0)(u_4,0.2,0.0)\}$
$(G_B,e_4) = \{(u_1,0.7,0.0);(u_2,0.6,0.0);(u_3,0.5,0.0);(u_4,0.3,0.0)\}$

Step 2 :

$$\tilde{A}^{\circ} = \begin{bmatrix} (1,0.6) & (1,0.8) & (1,0.5) & (1,0.3) \\ (1,0.9) & (1,0.7) & (1,0.4) & (1,0.7) \\ (1,0.6) & (1,0.8) & (1,0.6) & (1,0.3) \\ (1,0.8) & (1,0.2) & (1,0.4) & (1,0.5) \end{bmatrix}$$

$$\begin{array}{cccc} d_1 & d_2 & d_3 & d_4 \end{array}$$

$$\tilde{B}^{\circ} = \begin{bmatrix} (1,0.8) & (1,0.9) & (1,0.6) & (1,0.3) \\ (1,0.2) & (1,0.4) & (1,0.5) & (1,0.7) \\ (1,0.9) & (1,0.7) & (1,0.6) & (1,0.2) \\ (1,0.7) & (1,0.6) & (1,0.5) & (1,0.3) \end{bmatrix}$$

Step 3:

$$\tilde{A}-\tilde{B} = \begin{bmatrix} (0.6,0.0) & (0.8,0.0) & (0.5,0.0) & (0.3,0.0) \\ (0.2,0.0) & (0.4,0.0) & (0.4,0.0) & (0.7,0.0) \\ (0.6,0.0) & (0.7,0.0) & (0.6,0.0) & (0.2,0.0) \\ (0.7,0.0) & (0.2,0.0) & (0.4,0.0) & (0.3,0.0) \end{bmatrix}$$

$$\mu\nu\ \left(\tilde{A}-\tilde{B}\right) = \begin{pmatrix} 0.6 & 0.8 & 0.5 & 0.3 \\ 0.2 & 0.4 & 0.4 & 0.7 \\ 0.6 & 0.7 & 0.6 & 0.2 \\ 0.7 & 0.2 & 0.4 & 0.3 \end{pmatrix}$$

Step 4 :

$$\tilde{A}^{\circ} - \tilde{B}^{\circ} = \begin{bmatrix} (1,0.8) & (1,0.9) & (1,0.6) & (1,0.3) \\ (1,0.9) & (1,0.7) & (1,0.5) & (1,0.7) \\ (1,0.9) & (1,0.8) & (1,0.6) & (1,0.3) \\ (1,0.8) & (1,0.6) & (1,0.5) & (1,0.5) \end{bmatrix}$$

$$\mu\nu\ \left(\tilde{A}^{\circ} - \tilde{B}^{\circ}\right) = \begin{bmatrix} 0.2 & 0.1 & 0.4 & 0.7 \\ 0.1 & 0.3 & 0.5 & 0.3 \\ 0.4 & 0.2 & 0.4 & 0.7 \\ 0.2 & 0.4 & 0.5 & 0.5 \end{bmatrix}$$

$$\tilde{A} = \begin{array}{c} \\ P_1 \\ P_2 \\ P_3 \\ P_4 \end{array} \begin{array}{c} \begin{array}{cccc} d_1 & d_2 & d_3 & d_4 \end{array} \\ \begin{bmatrix} (0.6,0.0) & (0.8,0.0) & (0.5,0.0) & (0.3,0.0) \\ (0.9,0.0) & (0.7,0.0) & (0.4,0.0) & (0.7,0.0) \\ (0.6,0.0) & (0.7,0.0) & (0.6,0.0) & (0.3,0.0) \\ (0.8,0.0) & (0.2,0.0) & (0.4,0.0) & (0.5,0.0) \end{bmatrix} \end{array}$$

$$\tilde{A} = \begin{array}{c} \\ S_1 \\ S_2 \\ S_3 \\ S_4 \end{array} \begin{array}{c} \begin{array}{cccc} \mathrm{P}_1 & \mathrm{P}_2 & \mathrm{P}_3 & \mathrm{P}_4 \end{array} \\ \begin{bmatrix} (0.8, 0.0) & (0.9, 0.0) & (0.6, 0.0) & (0.3, 0.0) \\ (0.2, 0.0) & (0.4, 0.0) & (0.5, 0.0) & (0.7, 0.0) \\ (0.9, 0.0) & (0.7, 0.0) & (0.6, 0.0) & (0.2, 0.0) \\ (0.7, 0.0) & (0.6, 0.0) & (0.5, 0.0) & (0.3, 0.0) \end{bmatrix} \end{array}$$

Step 5 :

$$S(\mu v(\tilde{A} - \tilde{B}) - \mu v(\tilde{A}^{\circ} - \tilde{B}^{\circ})$$

$$= \begin{pmatrix} 0.6 & 0.8 & 0.5 & 0.3 \\ 0.2 & 0.4 & 0.4 & 0.7 \\ 0.6 & 0.7 & 0.6 & 0.2 \\ 0.7 & 0.2 & 0.4 & 0.3 \end{pmatrix} - \begin{pmatrix} 0.2 & 0.1 & 0.4 & 0.7 \\ 0.1 & 0.3 & 0.5 & 0.3 \\ 0.4 & 0.2 & 0.4 & 0.7 \\ 0.2 & 0.4 & 0.5 & 0.5 \end{pmatrix}$$

$$= \begin{pmatrix} 0.2 & 0.7 & 0.1 & -0.4 \\ 0.1 & 0.1 & -0.1 & 0.4 \\ 0.2 & 0.5 & 0.2 & -0.5 \\ 0.5 & -0.2 & -0.1 & -0.2 \end{pmatrix} \begin{array}{c} 0.6 \\ 0.5 \\ 0.4 \\ 0 \end{array}$$

Step 6 :

Total Score

$$\begin{array}{c} S_1 \\ S_2 \\ S_3 \\ S_4 \end{array} \begin{pmatrix} 0.6 \\ 0.5 \\ 0.4 \\ 0 \end{pmatrix}$$

V. Conclusion :

We see that, Patient S_1 suffering more than others. We represent new operations handling fuzzy soft matrices. According to these operations we established new result on fuzzy soft matrices. Finally a problem based on decision making theory is solved by on algorithm which we presented in this paper.

Stressful life style and lack of exercise can load to hemorrhoids. Yoga is beneficial to either treat or prevent hemorrhoids. It can both alleviate the discomfort or help prevent it from forming.

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