Decision making Problems of Membership Matrix and Comparison matrix under Fuzzy Environment

[(1)]Dr.Mrs.N.Sarala, Associate Professor, Department of Mathematics, A.D.M.College for Women(Autonomous),Nagapattinam.
[(2)]Mrs.I.Jannathul Firthouse, Assistant Professor, Department of Mathematics, A.D.M.College for Women(Autonomous),Nagapattinam.
[(3)]Miss.R.Rajeswari, M.Phil.,Scholar, A.D.M.College for Women(Autonomous),Nagapattinam.

Abstract : ***Making decisions is undoubtedly one of the most fundamental activities of human beings. We are all faced in our daily life with Varieties of alternative actions available to us and atleast in some instances, we have to decide which of the available actions to take. The field of decision making are the most fruitful and interesting area of application of fuzzy set theory. In real life situations, Uncertain information gathered for decision making requires the use of "fuzzy". In this paper procedures are presented for medical diagnosis and for fuzzy decision model. Examples are illustrated to verify the proposed approach.***

Keywords : Medical Diagnosis, Fuzzy Matrix, membership function, Decision Making, Triangular fuzzy Number.

I.INTRODUCTION

The field of Medicine and decision making are the most fruitful and interesting area of applications of fuzzy set theory. In recent years fuzzy set theory and fuzzy logic are highly suitable and applicable for developing knowledge based system. Making decision is undoubtedly one of the most fundamental activities of human beings. Fuzzy logic has provided to be a powerful tool for decision making systems, such as expert systems and pattern classification systems. Fuzzy set theory has already been used in some medical expert systems. In this paper, we would like to discuss how fuzzy set theory and fuzzy logic can be used for developing knowledge based system in medicine. Some basic definitions of fuzzy set theory has been discussed in section 2. In section 3, a novel approach is presented for medical diagnosis which is also an extension of sanchez's approach with modified procedure using triangular fuzzy number matrices and its new membership function. In section 4, a procedure is proposed for fuzzy decision model using new relativity function and comparison matrix. In both the sections illustrative example is included to demonstrate the proposed approach. Some conclusions are given in section 5.

II.PRELIMINARIES

Definition 2.1 Triangular fuzzy Number

Triangular Fuzzy Number is denoted as $A = (a_1, a_2, a_3), a_1, a_2, a_3 \in \mathcal{R}, a_1 < a_2 < a_3$.

Definition 2.2 Triangular fuzzy Number Matrix

Triangular Fuzzy Number Matrix of order $m \times n$ is defined as $A = (a_{ij})_{m\times n}$, where $a_{ij} = (a_{ijL}, a_{ijM}, a_{ijU})$ is the ij th element of A. a_{ijL}, a_{ijU} are the left and right spreads of a_{ij} respectively and a_{ijM} is the mean value.

Definition 2.3 Addition and Subtraction Operation on Triangular fuzzy Number Matrix

Let $A = (a_{ij})_{n\times n}$ and $B = (b_{ij})_{n\times n}$ be the two triangular fuzzy number matrices of same order. Then

(i) Addition Operation

$A + B = (a_{ij} + b_{ij})_{n\times n}$ where $a_{ij} + b_{ij} = (a_{ijL} + b_{ijL},\ a_{ijM} + b_{ijM}, a_{ijU} + b_{ijU})$ is the ij th element of $A + B$.

(ii) Subtration Operation

$A - B = (a_{ij} - b_{ij})_{n\times n}$ where $a_{ij} - b_{ij} = (a_{ijL} - b_{ijU}, a_{ijM} - b_{ijM}, a_{ijU} - b_{ijL})$ is the ij th element of $A - B$. The same condition holds for triangular fuzzy membership number.

Definition 2.4 Multiplication Operation on Triangular fuzzy Number Matrix

Let $A = (a_{ij})_{m\times p}$ and $B = (b_{ij})_{p\times n}$ be the two triangular fuzzy number matrices, then the multiplication operation $A . B = (c_{ij})_{m\times n}$ where $c_{ij} = \sum_{k=1}^{p} a_{ik} b_{kj}$ for $i = 1,2, \dots, m$ and $j = 1,2, \dots, n$

Definition 2.5 Max-Min Composition on fuzzy Membership Value

Let F_{mn} denote the set of all $m \times n$ matrices over F. Elements of F_{mn} are called as fuzzy membership value matrices. For $A = (a_{ij}) \in F_{mp}$ and $B = (b_{ij}) \in F_{pn}$, the max-min product

$$A\,(.)B = \left(\sup_k\left[\left\{inf\left(a_{ik}, b_{kj}\right)\right\}\right]\right) \in F_{mn}$$

Definition 2.6 Arithmetic Mean (AM) for triangular fuzzy number :

Let $A = (a_1, a_2, a_3)$ be a triangular fuzzy number, then $AM\ A = \frac{a_1+a_2+a_3}{3}$. The same condition holds for triangular fuzzy membership number.

III.MEDICAL DIAGNOSIS UNDER FUZZY ENVIRONMENT

Let S be the set of symptoms of certain diseases, D is a set of diseases and P is a set of Patients. The elements of triangular fuzzy number matrix are defined as $A = (a_{ij})_{m\times l}$ where $a_{ij} = (a_{ijL}, a_{ijM}, a_{ijU})$ is the ij[th] element of A, $0 \le a_{ijL} \le a_{ijM} \le a_{ijU} \le 10$. Here a_{ijL} is the lower bound, a_{ijM} is the moderate value and a_{ijU} is the upper bound.

Procedure 3.1

Step 1 : Construct a triangular fuzzy matrix (F,D) over S, where F is a mapping given by $F: D \to \check{F}(S)$, $\check{F}(S)$ is a set of all triangular fuzzy sets of S. This matrix is denoted by R_0 which is the fuzzy occurrence matrix or symptom-disease triangular fuzzy number matrix.

Step 2 : Construct another triangular fuzzy number matrix (F_1, S) over P, where F_1 is a mapping given by $F_1: S \to F(P)$. This matrix is denoted by R_s which is the patient symptom triangular fuzzy number matrix.

Step 3 : Convert the elements of triangular fuzzy number matrix into its membership fumction as follows : Membership function of $a_{ij} = (a_{ijL}, a_{ijM}, a_{ijU})$ is defined as

$\mu_{a_{ij}} = \left(\frac{a_{ijL}}{10} \leq \frac{a_{ijM}}{10} \leq \frac{a_{ijU}}{10}\right)$, if $0 \leq a_{ijL} \leq a_{ijM} \leq a_{ijU} \leq 10$, where $0 \leq \frac{a_{ijL}}{10} \leq \frac{a_{ijM}}{10} \leq \frac{a_{ijU}}{10} \leq 1$.

Now, the matrix R_0 and R_s are converted into triangular fuzzy membership matrices namely $(R_0)_{mem}$ and $(R_s)_{mem}$.

Step 4 : Compute the following relation matrices.

$R_1 = (R_s)_{mem}(.)(R_0)_{mem}$ it is calculated using Definition 2.5.

$R_2 = (R_s)_{mem}(.)(J - (R_0)_{mem})$, where J is the triangular fuzzy membership matrix in which all entries are (1,1,1). $(J - (R_0)_{mem})$ is the complement of $(R_0)_{mem}$ and it is called as non symptom-disease triangular fuzzy membership matrix.

$R_3 = (J - (R_s)_{mem})(.)(R_0)_{mem}$, where $(J - (R_s)_{mem})$ is the complement of R_s and it is called as non patient-symptom triangular fuzzy membership matrix.

R_2 and R_3 are calculated using subtraction operation and Definition 2.5.

$R_4 = \max\{R_2, R_3\}$. It is calculated using Definition 2.6

The elements of R_1, R_2, R_3, R_4 is of the form $Y_{ij} = (y_{ijL}, y_{ijM}, y_{ijU})$ where $0 \leq y_{ijL} \leq y_{ijM} \leq y_{ijU} \leq 1$.

$R_5 = R_1 - R_4$. It is calculated using subtration operation. The elements of R_5 is of the form $Z_{ij} = (Z_{ijL}, Z_{ijM}, Z_{ijU}) \in [-1,1]$, where $Z_{ijL} \leq Z_{ijM} \leq Z_{ijU}$.

Step 5 : Calculate $R_6 = AM(Z_{ij})$ and Row'_i = Maximum of i th row which helps the decision maker to strongly confirm the disease for the patient.

Example 3.1

Suppose there are three patients P_1, P_2 and P_3 in a hospital with symptoms headache, Joint Pains, Vomiting, Diarrhea. Let the Possible diseases relating to the above symptoms be Swine flu and Dengue.

Step 1 : We consider the Set $S = \{s_1, s_2, s_3, s_4\}$ as universal set where s_1, s_2, s_3 *and* s_4 represent the symptoms headache, Joint Pains, Vomiting, Diarrhea respectively. and the set $D = \{d_1, d_2\}$. where d_1 and d_2 represent the parameters Swing flu and Dengue respectively.

Suppose that

$F(d_1) = [\langle e_1, (7,7.5,9)\rangle, \langle e_2, (3,3.5,5)\rangle, \langle e_3, (5,6.5,7)\rangle, \langle e_4, (3,4.5,5)\rangle]$

$$F(d_2) = \begin{bmatrix} \langle e_1, (6,7,8.5)\rangle, \langle e_2, (4.5,6,7)\rangle, \\ \langle e_3, (3.5,5.5,6.5)\rangle, \langle e_4, (8,9,10)\rangle \end{bmatrix}$$

The triangular fuzzy number matrix (F, D) is a parameterized family $(F(d_1), F(d_2))$ of all triangular fuzzy number matrix over the set S and are determined from expert medical documentation. Thus the triangular fuzzy number matrix (F, D) represents a relation matrix R_0 and it gives an approximate description of the triangular fuzzy number matrix medical knowledge of the two diseases and their symptoms given by

$$R_0 = \begin{array}{c} \\ s_1 \\ s_2 \\ s_3 \\ s_4 \end{array}\begin{array}{cc} d_1 & d_2 \\ (7,7.5,9) & (6,7,8.5) \\ (3,3,5.5) & (4.5,6,7) \\ (5,6.5,7) & (3.5,5,6.5) \\ (3,4.5,5) & (8,9,10) \end{array}$$

Step 2 : Again we take $P = \{p_1, p_2, p_3\}$ as universal set, where p_1, p_2 *and* p_3 as the universal set, where p_1, p_2 and p_3 represent Patients respectively and $S = \{s_1, s_2, s_3, s_4\}$ as the set pf parameters.

Suppose that $F_1(s_1) = [\langle p_1, (5.5,7,8.5)\rangle, \langle p_2, (3,4.5,5)\rangle, \langle p_3, (6,7.5,8)\rangle]$

$F_1(s_2) = [\langle p_1, (4,5,6.5)\rangle, \langle p_2, (3.5,6.5,7.5)\rangle, \langle p_3, (3,5,7.5)\rangle]$

$F_1(s_3) = [\langle p_1, (8,9.5,10)\rangle, \langle p_2, (3,4.5,5)\rangle, \langle p_3, (6.5,7.5,7.5)\rangle]$

$F_1(s_4) = [\langle p_1, (7.5,8,10)\rangle, \langle p_2, (4,5,6.5)\rangle, \langle p_3, (3,4.5,6)\rangle]$

The triangular fuzzy number matrix (F_1, S) is another parameterized family of triangular fuzzy matrix and gives a collection of approximate description of patient – Symptoms in the hospital. Thus the triangular fuzzy number matrix (F_1, S) represents a relation matrix R_s called patient-symptom matrix given by

$$R_s = \begin{array}{c} \\ p_1 \\ p_2 \\ p_3 \end{array}\begin{array}{cccc} s_1 & s_2 & s_3 & s_4 \\ (5.5,7,8.5) & (4,5,6.5) & (8,9.5,10) & (7.5,8,10) \\ (3,4.5,5) & (3.5,6.5,7.5) & (3,4.5,5) & (4,5,6.5) \\ (6,7.5,8) & (3,5,7.5) & (6.5,7.5,7.5) & (3,4.5,6) \end{array}$$

Step 3 :

$$(R_0)_{mem} = \begin{array}{c} \\ s_1 \\ s_2 \\ s_3 \\ s_4 \end{array}\begin{array}{cc} d_1 & d_2 \\ (0.7,0.75,0.9) & (0.6,0.7,0.85) \\ (0.3,0.3,0.55) & (0.45,0.6,0.7) \\ (0.5,0.65,0.7) & (0.35,0.5,0.65) \\ (0.3,0.45,0.5) & (0.8,0.9,1) \end{array}$$

$$(R_s)_{mem} = \begin{pmatrix} & s_1 & s_2 & s_3 & s_4 \\ p_1 & (0.55,0.7,0.85) & (0.4,0.5,0.65) & (0.8,0.95,1) & (0.75,0.8,1) \\ p_2 & (0.3,0.4,0.5) & (0.35,0.65,0.75) & (0.3,0.45,0.5) & (0.4,0.5,0.65) \\ p_3 & (0.6,0.75,0.8) & (0.3,0.5,0.75) & (0.65,0.75,0.75) & (0.3,0.45,0.6) \end{pmatrix}$$

Step 4 : Computing the following relation matrices

$$R_1 = (R_s)_{mem}(.)(R_0)_{mem} = \begin{pmatrix} & d_1 & d_2 \\ p_1 & (0.55,0.7,0.85) & (0.75,0.8,1) \\ p_2 & (0.3,0.45,0.55) & (0.4,0.6,0.7) \\ p_3 & (0.6,0.75,0.8) & (0.6,0.7,0.8) \end{pmatrix}$$

$$R_2 = (R_s)_{mem}(.)(J - (R_0)_{mem}) = \begin{pmatrix} & d_1 & d_2 \\ p_1 & (0.7,0.55,0.5) & (0.65,0.5,0.35) \\ p_2 & (0.4,0.65,0.5) & (0.35,0.45,0.35) \\ p_3 & (0.5,0.45,0.5) & (0.65,0.5,0.35) \end{pmatrix}$$

$$R_3 = (J - (R_s)_{mem})(.)(R_0)_{mem} = \begin{pmatrix} & d_1 & d_2 \\ p_1 & (0.45,0.3,0.35) & (0.45,0.5,0.35) \\ p_2 & (0.7,0.55,0.5) & (0.6,0.55,0.5) \\ p_3 & (0.4,0.45,0.4) & (0.7,0.55,0.4) \end{pmatrix}$$

$$R_4 = max\{R_2 R_3\} = \begin{pmatrix} & d_1 & d_2 \\ p_1 & (0.7,0.55,0.5) & (0.65,0.5,0.35) \\ p_2 & (0.7,0.65,0.5) & (0.6,0.55,0.5) \\ p_3 & (0.5,0.45,0.5) & (0.7,0.55,0.4) \end{pmatrix}$$

$$R_5 = R_1 - R_4 = \begin{pmatrix} & d_1 & d_2 \\ p_1 & (-0.15,0.15,0.35) & (0.10,0.3,0.65) \\ p_2 & (-0.4,-0.2,0.05) & (-0.2,0.05,0.2) \\ p_3 & (0.1,0.3,0.3) & (-0.1,0.15,0.4) \end{pmatrix}$$

Step 5 :

$$R_6 = \begin{pmatrix} & d_1 & d_2 & Row'_i = Max. of\ the\ i\ th\ row \\ p_1 & (0.1167) & (0.35) & 0.35 \\ p_2 & (-0.183) & (0.0167) & 0.0167 \\ p_3 & (0.233) & (0.15) & 0.233 \end{pmatrix}$$

p_1 and p_2 is suffering from dengue and p_3 is suffering from swine flu.

IV. DECISION MAKING UNDER FUZZY ENVIROMENT

PROCEDURE

Step 1 : Gather the imprecise estimation needed for the problem which is in the form of triangular fuzzy number matrix using equation (1).

Step 2 : Calculate the triangular membership matrix using equation (2).

Step 3 : By using equation (3). Let us calculate all of the relativity values $f(x_i/x_j)$, from the comparsion matrix using definition 2.6, this gives the solution to the required problem.

Here $f(x_i/x_j) = \frac{(0,0,0)}{(1,1,1)}\ for\ i = j$

Definition 4.1 : Relativity Function

Let x and y be Variables defined on a Universal Set X. The relativity function is denoted as $f(x/y)$ and is defined as

$$f(x/y) = \frac{\mu_y(x)-\mu_x(y)}{max(\mu_y(x),\mu_x(y))} \qquad (1)$$

where $\mu_y(x)$ is the membership function of x with respect to y for triangular fuzzy number.

Here $\mu_y(x) - \mu_x(y)$ is calculated using subtraction operation and $max(\mu_y(x),\mu_x(y))$ is calculated using definition 2.4.

Definition: 4.2 Comparison Matrix

Let $A = (x_1, x_2, \dots, x_{i-1}, x_i, x_{i+1}, \dots, x_n)$ be a set of n variables defined on X. Form a matrix of relativity values $f(x_i/x_j)$ where $x_i's$ for $i = 1$ to n are n variables defined on an universe X. The matrix $C = (c_{ij})$ is a square matrix of order n is called the comparison matrix (or) $C -$ matrix, with $AM\left(f(x_i/x_j)\right) = \frac{AM\left(\mu_{x_j}(x_i)-\mu_{x_i}(x_j)\right)}{AM\left(max\{\mu_{x_j}(x_i)-\mu_{x_i}(x_j)\}\right)}$ where AM denote the Arithmetic mean and it is calculated using definition 2.5. The comparison matrix is used to rank different fuzzy sets, the elements of $C -$ matrix $\in [-1,1]$. The smaller value in the i th row of the comparison matrix, that is $C_i = min\{f(x_i/X), i = 1\ to\ n\}$ variable. The minimum of $\{C_i'/i = 1\ to\ n\}$, that is, the smallest value in each of the rows of the $C -$ matrix will have the lowest weight for ranking purpose. Thus ranking the variable $x_1, x_2, \dots, x_n$ are determined by ordering the membership values $C_1', C_2', \dots, C_n'$.

Illustrative Example : 4.1

Step 1 : Let us find out who resembles a Grandmother most among her grand elder daughter (x_1), her Grand younger daughter (x_2) and her Grand son (x_3). we have the following imprecise estimations from family members.

$$A = \begin{matrix} & x_1 & x_2 & x_3 \\ x_1 & (10,10,10) & (6,7,8) & (2,4,6) \\ x_2 & (2,4,6) & (10,10,10) & (5,6,7) \\ x_3 & (2,4,6) & (1,3,5) & (10,10,10) \end{matrix}$$

Step 2 : Calculate the triangular membership matrix using equation (2).

$$A_{mem} = \begin{matrix} & x_1 & x_2 & x_3 \\ x_1 & (1,1,1) & (0.6,0.7,0.8) & (0.2,0.4,0.6) \\ x_2 & (0.2,0.4,0.6) & (1,1,1) & (0.5,0.6,0.7) \\ x_3 & (0.2,0.4,0.6) & (0.1,0.3,0.5) & (1,1,1) \end{matrix}$$

$\mu_{x_1}(x_1) = (1,1,1),\quad \mu_{x_2}(x_1) = (0.6,0.7,0.8),\quad \mu_{x_3}(x_1) = (0.2,0.4,0.6),$
$\mu_{x_1}(x_2) = (0.2,0.4,0.6),\quad \mu_{x_2}(x_2) = (1,1,1),\quad \mu_{x_3}(x_2) = (0.5,0.6,0.7),$
$\mu_{x_1}(x_3) = (0.2,0.4,0.6),\quad \mu_{x_2}(x_3) = (0.1,0.3,0.5),\quad \mu_{x_3}(x_3) = (1,1,1),$

Step 3 :

$$f(x_1/x_1) = \frac{\mu_{x_1}(x_1) - \mu_{x_1}(x_1)}{max\{\mu_{x_1}(x_1), \mu_{x_1}(x_1)\}} = \frac{\{(1,1,1) - (1,1,1)\}}{max\{(1,1,1),(1,1,1)\}} = \frac{(0,0,0)}{(1,1,1)}$$

$$AMf(x_1/x_1) = \frac{0}{1} = 0$$

$$f(x_1/x_2) = \frac{\mu_{x_2}(x_1) - \mu_{x_1}(x_2)}{max\{\mu_{x_2}(x_1), \mu_{x_1}(x_2)\}} = \frac{\{(0.6,0.7,0.8) - (0.2,0.4,0.6)\}}{max\{(0.6,0.7,0.8),(0.2,0.4,0.6)\}} = \frac{(0,0.3,0.6)}{(0.6,0.7,0.8)}$$

$$AMf(x_1/x_2) = \frac{0.3}{0.7} = 0.428$$

$$f(x_1/x_3) = \frac{\mu_{x_3}(x_1) - \mu_{x_1}(x_3)}{max\{\mu_{x_3}(x_1), \mu_{x_1}(x_3)\}} = \frac{\{(0.2,0.4,0.6) - (0.2,0.4,0.6)\}}{max\{(0.2,0.4,0.6),(0.2,0.4,0.6)\}} = \frac{(-0.4,0,0.4)}{(0.2,0.4,0.6)}$$

$$AMf(x_1/x_3) = \frac{0}{0.4} = 0$$

$$f(x_2/x_1) = \frac{\mu_{x_1}(x_2) - \mu_{x_2}(x_1)}{max\{\mu_{x_1}(x_2), \mu_{x_2}(x_1)\}} = \frac{\{(0.2,0.4,0.6) - (0.6,0.7,0.8)\}}{max\{(0.2,0.4,0.6),(0.6,0.7,0.8)\}} = \frac{(-0.6,-0.3,0)}{(0.6,0.7,0.8)}$$

$$AMf(x_1/x_3) = \frac{-0.3}{0.7} = -0.43$$

$$f(x_2/x_2) = \frac{\mu_{x_2}(x_2) - \mu_{x_2}(x_2)}{max\{\mu_{x_2}(x_2), \mu_{x_2}(x_2)\}} = \frac{\{(1,1,1) - (1,1,1)\}}{max\{(1,1,1),(1,1,1)\}} = \frac{(0,0,0)}{(1,1,1)}$$

$$AMf(x_2/x_2) = \frac{0}{1} = 0$$

$$f(x_2/x_3) = \frac{\mu_{x_3}(x_2) - \mu_{x_2}(x_3)}{max\{\mu_{x_3}(x_2), \mu_{x_2}(x_3)\}} = \frac{\{(0.5,0.6,0.7) - (0.1,0.3,0.5)\}}{max\{(0.5,0.6,0.7),(0.1,0.3,0.5)\}} = \frac{(0,0.3,0.6)}{(0.5,0.6,0.7)}$$

$$AMf(x_2/x_3) = \frac{0.3}{0.6} = 0.5$$

$$f(x_3/x_1) = \frac{\mu_{x_1}(x_3) - \mu_{x_3}(x_1)}{max\{\mu_{x_1}(x_3), \mu_{x_3}(x_1)\}} = \frac{\{(0.2,0.4,0.6) - (0.2,0.4,0.6)\}}{max\{(0.2,0.4,0.6),(0.2,0.4,0.6)\}} = \frac{0}{(0.2,0.4,0.6)}$$

$$AMf(x_3/x_1) = \frac{0}{0.6} = 0$$

$$f(x_3/x_2) = \frac{\mu_{x_2}(x_3) - \mu_{x_3}(x_2)}{max\{\mu_{x_2}(x_3), \mu_{x_3}(x_2)\}} = \frac{\{(0.1,0.3,0.5) - (0.1,0.3,0.5)\}}{max\{(0.1,0.3,0.5),(0.1,0.3,0.5)\}} = \frac{(-0.6,-0.3,0)}{0.5,0.6,0.7}$$

$$AMf(x_3/x_2) = \frac{-0.3}{0.6} = -0.5$$

$$f(x_3/x_3) = \frac{\mu_{x_3}(x_3) - \mu_{x_3}(x_3)}{max\{\mu_{x_3}(x_3), \mu_{x_3}(x_3)\}} = \frac{\{(1,1,1) - (1,1,1)\}}{max\{(1,1,1),(1,1,1)\}} = \frac{0}{(1,1,1)}$$

$$AMf(x_3/x_3) = \frac{0}{1} = 0$$

The Comparison matrix $C = (c_{ij}) = AM\left(f(x_i/x_j)\right)$ is given by

$$A = \begin{array}{c} \\ x_1 \\ x_2 \\ x_3 \end{array} \begin{array}{c} \begin{array}{ccc} x_1 & x_2 & x_3 \end{array} \\ \begin{bmatrix} 0 & 0.428 & 0 \\ -0.43 & 0 & 0.5 \\ 0 & -0.5 & 0 \end{bmatrix} \end{array} \quad \begin{array}{c} c_i{}' = \min of\ ith\ row \\ 0 \\ -0.43 \\ -0.5 \end{array}$$

For this problem the ranking is x_1, x_2, x_3. Hence Grand elder daughter resembles a Grand mother 'most'

CONCLUSION

Medicine is one of the field in which the applicability of fuzzy set theory was recognized quite early. As fuzzy decision making is a most important scientific, social and economic endeavour, there exist several major approaches within the theories of fuzzy decision making. Here we have used the ranking order to deal with the vagueness in imprecise determination of preferences.

REFERENCES

[1] H.K.Baruah, Towards forming a field of fuzzy sets, International Journal of Energy, Information and Communications, 2(1) (2011), 16-20.

[2] H.K.Baruah, The theory of fuzzy sets: Beliefs and Realities, International Journal of Energy, Infor mation and Communication, 2(2) (2011), 1-22.

[3] R.Bellman and L.A.Zadeh, Decision making in a fuzzy environment, Management Science, 17 (1970), B144-B164.

[4] A.Edward Samuel and M.Balamurugan, Application of intuitionistic fuzzy sets in medical diagnosis, Proceeding of the International Conference on Mathematical Modeling and Applied Soft Computing 1 (2012), 189-194.

[5] A.O.Esogbue and R.C.Elder, Fuzzy Diagnosis decision models, Fuzzy Sets and systems, 3(1980), 1-9.

[6] A.R.Meenakshi, Fuzzy matrix theory and applications, MJP Publishers, 2008.

[7] A.R.Meenakshi and M.Kaliraja, An application of Interval valued fuzzy matrices in Medical Diagnosis, International Journal of Mathematical Analysis, 5(36) (2011), 1791-1802.

[8] T.J.Neog and D.K.Sut, Theory of fuzzy soft sets from a new perspective, International Journal of Latest Trends in Computing, 2(3), (2011), 439-450.

[9] E.Sanchez, Resolution of Composite fuzzy relation equations, Information and control, 30 (1976), 38-48.

[10] E.Sanchez, Inverse of fuzzy relations, application to possibility distribution and medical diagnosis Fuzzy sets and systems,2(1) (1979), 75-86.

[11] M.Shimura, Fuzzy sets concept in ranking ordering objects, J.Math. Anal. Appl., 43(1973), 717-733.