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Decision Making with help of the Repeated Average Method of Fuzzy Soft Matrix

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ABSTRACT. Most of our traditional tools for formal modeling, reasoning, and computing are crisp, deterministic, and precise in character. But many complicated problems in economics, engineering, environment, social science, medical science, etc., involve data which are not always all crisp. We cannot always use the classical methods because of various types of uncertainties present in these problems. The important existing theories viz. theory of probability, theory of fuzzy sets [4], theory of intuitionistic fuzzy sets [7], theory of vague sets [8], theory of rough sets [9] can be considered as mathematical tools for dealing with uncertainties. But all these theories have their own difficulties. The reason for these difficulties is, possibly, the inadequacy of the parametrization tool of the theories; and consequently, D. Molodtsov [1] initiated the concept of soft theory as a new mathematical tool for clearing with uncertainties which is free from the above difficulties. Soft set theory has a rich potential for applications in several directions. In this paper, some new definitions like expert fuzzy soft matrix, mean score fuzzy soft matrix, decision fuzzy soft matrix, fuzzy soft coefficient of variation have been introduced and finally a step by step relaxed and reliable method entitled Repeated Average Method of Fuzzy Soft Matrixhas been developed for decision making. Also some problems have been solved and compared the results with other results solved by other existing methods.

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1 Introduction

The concept of soft sets was first formulated byD. Molodtsov [1999] as a completely new mathematical tool for solving problems dealing with uncertainties [1]. Soft set is a parameterised general mathematical tool which deal with a collection of approximate descriptions of objects. Each approximate description has two parts, a predicate and an approximate value set. In classical mathematics, a mathematical model of an object is constructed and define the notion of exact solution of this model. Usually the mathematical model is too complicated and the exact solution is not easily obtained. So, the notion of approximate solution is introduced and the solution is calculated. In the soft set theory, we have the opposite approach to this problem. The initial description of the object has an approximate nature, and we do not need to introduce the notion of exact solution. The absence of any restrictions on the approximate description in soft set theory makes this theory very convenient and easily applicable in practice. Any parametrization we prefer can be used with the help of words and sentences, real numbers, functions, mappings and so on[13]. Molodtsov [1999] defines a soft set as a parameterized family of subsets of universe set where each element is considered as a set of approximate elements of the soft set[1]. In the past few years, the fundamentals of soft set theory have been studied by various researchers. Maji et al. [2003] presented a detailed theoretical study of soft sets which includes subset and super set of a soft set, equality of soft sets, operations on soft sets such as union, intersection, AND and OR- operations among others. They also studied and discussed the basic properties of these operations. Furthermore Maji, Biswas and Roy worked on soft set theory in [14]. Also Maji et al. [15] presented the definition of fuzzy soft set and Roy et al. presented some applications of this notion to decision making problems. Pei and Miao [2005] redefined subset and intersection of soft sets and discussed the relationship between soft sets and information systems. Ali et al. [2009] introduced some new operations such as the restricted union, the restricted intersection, the restricted difference and the extended intersection of two soft sets and discussed their basic properties. Babitha and Sunil [2010] introduced the concept of soft set relation and function and discussed many related concepts such as equivalence soft set relation, partition of soft sets, ordering on soft sets. In continuation of their work, Babitha and Sunil [2011] further worked on soft set relation and ordering by introducing the concept of anti-symmetric relation and transitive closure of a soft set relation. Yang and Guo [2011] introduced the notions of anti-symmetric closure of a soft set relation and obtained with proofs some results involving them. Sezgin and Atagun [2011], Ge and Yang [2011], Fuli [2011] etc., gave some modifications in the work of Maji et al. [2003] and also established some new results. Sezgin and Atagun [2011], also introduced the restricted symmetric difference of soft sets and investigated its properties with examples. Singh and Onyeozili [2012] obtained some results on distributive and absorption properties with respect to various operations on soft sets. Singh and Onyeozili [2012] proved that the operations defined on soft sets are equivalent to the corresponding operations defined on their soft matrices.Cagman and Enginoglu [2] defined soft matrices which were a matrix representation of the soft sets and constructed a soft max-min decision making method. Cagman and Enginoglu[3]defined fuzzy soft matrices and constructed a decision making problem. Borah et al.[6]extended fuzzy soft matrix theory and its application. Maji and Roy [10] presented a novel method of object from an imprecise multi-observer data to deal with decision making based on fuzzy soft sets. In this paper, some new definitions have been familiarised and lastly a stress-free and dependable method entitled Repeated Average Method of Fuzzy SoftMatrixhas been developed for swift decision making. Moreover some problems have been solved and compared the results with another results solved by other existing methods.

2 Preliminaries

In this section, we present the notion of soft sets introduced byD.Molodtsov in [1], and some useful definitions from the literature.

2.1. Soft Set [1]: Suppose U be a universal set and E be a set of parameters or attributes w.r.to U Let $P(U)$ denote the power set of U and $A \subseteq E$. A pair (F, A) is called a soft set over U, where F is a mapping given by $F : E \to P(U)$. Thus (F, A) is defined as

$$(F, A) = \{F(e) \in P(U) : e \in E, F(e) = \phi \quad if \quad e \notin A\}$$

For $e \in A, F(e)$ may be considered as the set of e-element or e-approximate elements of the soft set $F, A)$.

2.2 Fuzzy Soft Set [12]: Suppose U be an initial universal set and E be a set of parameters and $A \subseteq E$. A pair (F_A, E) is called a fuzzy soft set(FSS) over U, where F_A is a mapping given by $F_A : E \to I^U$,where I^U denotes the collection of al fuzzy subsets of U.

2.2 Fuzzy Soft Matrices[2,3]: Let $U = \{u_1, u_2, u_3, ...u_m\}$ be the universal set and $E = \{e_1, e_2, e_3...e_n\}$ be the set of parameters. Let $A \subseteq E$ and (F, A) be a fuzzy soft set in the fuzzy soft class (U, E). Then we would represent the fuzzy soft set (F, A), in matrix form as $A_{m\times n} = [a_{ij}]_{m\times n}$ or simply by$A = [a_{ij}]$, where

$$a_{ij} = \begin{cases} \mu_j(u_i); e_j \in A \\ 0, \ e_j \notin A \end{cases}$$

and $i = 1, 2, 3...m; j = 1, 2, 3...n$. Here $\mu_j(u_i)$ represents the membership of u_i in the fuzzy set $F(e_j)$. We would identify a fuzzy soft set with its fuzzy soft matrix and use these two concepts interchangeable. The set of all $m \times n$ fuzzy soft matrixes would be denoted by $FSM_{m\times n}$. **Example:** Let $U = \{u_1, u_2, u_3, u_4\}$ be the universal set and $E = \{e_1, e_2, e_3, e_4, e_5\}$ be the set of parameters. Let $P = \{e_1, e_2, e_4\} \subseteq E$ and (F, P) be a fuzzy soft, where

$$(F, P) = \{F(e_1) = \{(u_1, 0.7), (u_2, 0.6), (u_3, 0.7), (u_4, 0.5)\}$$

$$F(e_2) = \{(u_1, 0.8), (u_2, 0.6), (u_3, 0.1), (u_4, 0.5)\}$$

$$F(e_4) = \{(u_1, 0.1), (u_2, 0.4), (u_3, 0.7), (u_4, 0.3)\}\}$$

The fuzzy soft matrix representing this fuzzy soft set would be represented in our notation as $A = \begin{vmatrix} 0.7 & 0.8 & 0.0 & 0.1 & 0.0 \\ 0.6 & 0.6 & 0.0 & 0.4 & 0.0 \\ 0.7 & 0.1 & 0.0 & 0.7 & 0.0 \\ 0.5 & 0.5 & 0.0 & 0.3 & 0.0 \end{vmatrix}$

2.3 Fuzzy Soft Column Matrix[2]: Let $A = [a_{ij}] \in FSM_{m\times n}$, where $a_{ij} = \mu_j(u_i)$. If $n = 1$, then A is called a fuzzy soft column matrix.

2.4 Arithmetic Mean (AM) of a Fuzzy Soft Matrix[16]: Let $A = [a_{ij}] \in FSM_{m\times n}$.Then the arithmetic mean of fuzzy soft matrix of membership value denoted by A_{AM} is defined by

$$A_{AM} = \frac{\sum_{j=1}^{n} \mu_{ij}^{A}}{n}$$

Example: Let $A = \begin{vmatrix} 0.50 & 0.22 & 0.35 \\ 0.65 & 0.81 & 0.70 \\ 0.55 & 1.00 & 0.40 \end{vmatrix}$. Then $A_{AM} = \begin{vmatrix} 0.357 \\ 0.72 \\ 0.65 \end{vmatrix}$

3 Some New Concepts

It is true that, all parameters are not considered as equally important while selecting any object (candidate for any post or product of a company) by an expert. Few parameters have the most significant value and some have less. Also the scores (point or membership grade or grade point ofcourse in between 0 to 1) given by an expert corresponding to each parameter for an object(candidate or product) may not be the same.In this situation it will be wise taking the average score for each object (candidate or product)for all the parameters given by an expert. This result reflects themost reliable and acceptable score for the candidate. Furthermore the both parties (Expert and object) should satisfy and keep trust on this score as it is logically, statistically as well as mathematically proved earlier. On the other side, some experts may give the privilege any object.The average result would minimize the partiality and balance the situation.

Then we have taken the average of all experts scores for each object. This result implies the exact judgement for each candidate. As a result no expert can take any privilege for any specific candidates or product.

3.1 Expert Fuzzy Soft Matrix: Let $A_s = [a_{ij}] \in FSM_{m \times n}$ are fuzzy soft matrices with m objects(products/students/patients/job applicants/countries etc.), each of which has n parameters (attributes), where $s = 1, 2, 3, ...k$ and $i = 1, 2, 3, ...n$ and for all $a_{ij} \in [0, 1] \forall i, j$.

$$A_1 = \begin{vmatrix} a_{11}^1 & a_{12}^1 & .... & a_{1n}^1 \\ a_{21}^1 & a_{22}^1 & .... & a_{2n}^1 \\ \vdots & \vdots & .... & \vdots \\ a_{m1}^1 & a_{m2}^1 & .... & a_{mn}^1 \end{vmatrix}, A_2 = \begin{vmatrix} a_{11}^2 & a_{12}^2 & .... & a_{1n}^2 \\ a_{21}^2 & a_{22}^2 & .... & a_{2n}^2 \\ \vdots & \vdots & .... & \vdots \\ a_{m1}^2 & a_{m2}^2 & .... & a_{mn}^2 \end{vmatrix}, ...A_k = \begin{vmatrix} a_{11}^k & a_{12}^k & .... & a_{1n}^k \\ a_{21}^k & a_{22}^k & .... & a_{2n}^k \\ \vdots & \vdots & .... & \vdots \\ a_{m1}^k & a_{m2}^k & .... & a_{mn}^k \end{vmatrix}$$

These are considered as expert fuzzy soft matrices.

3.2 Mean Score Fuzzy Soft Matrix: Consider the above expert fuzzy soft matrices (in 3.1). Then their mean score fuzzy soft matrices are denoted by $\bar{A}_s$ and defined as follows:

$$\bar{A}_1 = \begin{vmatrix} \frac{\sum_{j=1}^{n} a_{1j}^1}{n} \\ \frac{\sum_{j=1}^{n} a_{2j}^1}{n} \\ \vdots \\ \frac{\sum_{j=1}^{n} a_{mj}^1}{n} \end{vmatrix}, \bar{A}_2 = \begin{vmatrix} \frac{\sum_{j=1}^{n} a_{1j}^2}{n} \\ \frac{\sum_{j=1}^{n} a_{2j}^2}{n} \\ \vdots \\ \frac{\sum_{j=1}^{n} a_{mj}^2}{n} \end{vmatrix}, ...\bar{A}_k = \begin{vmatrix} \frac{\sum_{j=1}^{n} a_{1j}^k}{n} \\ \frac{\sum_{j=1}^{n} a_{2j}^k}{n} \\ \vdots \\ \frac{\sum_{j=1}^{n} a_{mj}^k}{n} \end{vmatrix}$$

3.3 Decision Fuzzy Soft Matrix: Consider the above mean score fuzzy soft matrices (in 3.2).Then the decision fuzzy soft matrix is defined as follows:

$$\frac{1}{k}\sum_{s=1}^{k}\bar{A}_s = \begin{vmatrix} \frac{\frac{\sum_{j=1}^{n} a_{1j}^1}{n}+\frac{\sum_{j=1}^{n} a_{1j}^2}{n}+\ldots+\frac{\sum_{j=1}^{n} a_{1j}^k}{n}}{k} \\ \frac{\frac{\sum_{j=1}^{n} a_{2j}^1}{n}+\frac{\sum_{j=1}^{n} a_{2j}^2}{n}+\ldots+\frac{\sum_{j=1}^{n} a_{2j}^k}{n}}{k} \\ \vdots \\ \frac{\frac{\sum_{j=1}^{n} a_{mj}^1}{n}+\frac{\sum_{j=1}^{n} a_{mj}^2}{n}+\ldots+\frac{\sum_{j=1}^{n} a_{mj}^k}{n}}{k} \end{vmatrix}$$

3.4 Fuzzy Soft Standard Deviation: Standard deviation may be defined as the positive square root of the arithmetic mean of the squares of deviations of given observations from their arithmetic mean.For ungrouped data,the standard deviation is

$$\sigma = \sqrt{\frac{\sum X^2}{N} - \left(\frac{\sum X}{N}\right)^2}$$

Here X are the entries $(0 \leq X \leq 1)$ from the Mean Score Fuzzy Soft Matrices and maximum score in Decision Fuzzy Soft Matrix will be considered as mean.

3.5 Fuzzy Soft Coefficient of Variation: The relative measure of dispersion based upon fuzzy soft standard deviation is called fuzzy soft coefficient of standard deviation. The fuzzy soft coefficient of standard deviation multiplied by 100 gives the fuzzy soft coefficient of variation.

Thus, Fuzzy Soft Coefficient of variation(C.V)=$\frac{\sigma}{Mean} \times 100$

Where, σ and mean are both measured in the same units.

4 Repeated Average Method of Fuzzy Soft Matrix in Decision Making Algorithm:

Input: Fuzzy Soft set of m objects (products/students/patients/job applicants/countries etc.), each of which has n parameters (attributes).

Output: An optimum result.

Step-1: Consider the fuzzy soft matrix for each expert(called Expert Fuzzy Soft Matrix).

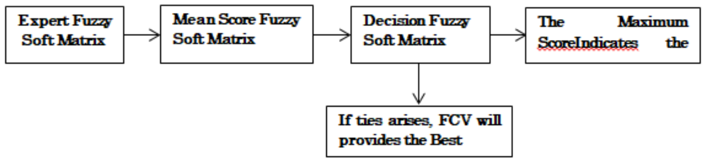
Step-2: Compute the mean of each Expert Fuzzy Soft Matrix (called Mean Score Fuzzy Soft Matrix).

Step-3: Compute the mean of all experts scores from the Mean Score Fuzzy Soft Matrix (called Decision Fuzzy Soft Matrix).

Step-4: Pick up the maximum score and select the most efficient and trustable object(candidate or product).

Step-5: If ties arises fuzzy coefficient of variation (FCV) might be applied for selecting the best object (Use the data from the Mean Score Fuzzy Soft Matrix).

Flow Chart of the Algorithm:



Problem 1 : In [6] , $U = \{c_1, c_2, c_3, c_4, c_5\}$ be the five candidates appearing in an interview for appointment in managerial level in a company and $E = \{e_1(enterprising), e_2(confident), e_3(willing\ \ to\ \ take\ \ risk)\}$ be the set of parameters. Suppose three experts, Mr. A, Mr. B and Mr. C take interview of the five candidates and the following fuzzy soft matrices are constructed accordingly.

$$A = \begin{vmatrix} 0.3 & 0.2 & 0.1 \\ 0.5 & 0.4 & 0.2 \\ 0.6 & 0.5 & 0.7 \\ 0.4 & 0.6 & 0.8 \\ 0.8 & 0.6 & 0.3 \end{vmatrix}, B = \begin{vmatrix} 0.7 & 0.2 & 0.5 \\ 0.6 & 0.4 & 0.9 \\ 0.7 & 0.8 & 0.6 \\ 0.5 & 0.6 & 1.0 \\ 0.4 & 0.5 & 0.7 \end{vmatrix},\ andC = \begin{vmatrix} 0.5 & 0.4 & 0.6 \\ 0.4 & 0.7 & 0.6 \\ 0.6 & 0.5 & 0.5 \\ 0.8 & 0.6 & 0.4 \\ 0.5 & 0.6 & 0.5 \end{vmatrix}$$

Solution:The problem is going to be solved by the proposed method:

Step-1: The Expert Fuzzy Soft Matrices are

$$A = \begin{vmatrix} 0.3 & 0.2 & 0.1 \\ 0.5 & 0.4 & 0.2 \\ 0.6 & 0.5 & 0.7 \\ 0.4 & 0.6 & 0.8 \\ 0.8 & 0.6 & 0.3 \end{vmatrix}, B = \begin{vmatrix} 0.7 & 0.2 & 0.5 \\ 0.6 & 0.4 & 0.9 \\ 0.7 & 0.8 & 0.6 \\ 0.5 & 0.6 & 1.0 \\ 0.4 & 0.5 & 0.7 \end{vmatrix},\ andC = \begin{vmatrix} 0.5 & 0.4 & 0.6 \\ 0.4 & 0.7 & 0.6 \\ 0.6 & 0.5 & 0.5 \\ 0.8 & 0.6 & 0.4 \\ 0.5 & 0.6 & 0.5 \end{vmatrix}$$

Step-2: TheMean Score Fuzzy Soft Matrices are

$$\bar{A} = \begin{vmatrix} 0.2 \\ 0.367 \\ 0.6 \\ 0.6 \\ 0.567 \end{vmatrix}, \bar{B} = \begin{vmatrix} 0.467 \\ 0.633 \\ 0.7 \\ 0.7 \\ 0.533 \end{vmatrix},\ and\ \bar{C} = \begin{vmatrix} 0.5 \\ 0.567 \\ 0.533 \\ 0.6 \\ 0.533 \end{vmatrix}$$

Step-3: TheDecision Fuzzy Soft Matrix is

$$\begin{vmatrix} 0.389 \\ 0.522 \\ 0.611 \\ 0.633 \\ 0.544 \end{vmatrix}$$

Step-4: From the above Decision Fuzzy Soft Matrix the maximum score is 0.633 corresponding to the candidate c_4. Hence the candidate c_4 should be appointed for the vacant managerial post. It is noted that, the decision found by the Repeated Average Method of Fuzzy Soft Matrix has matched with the decision found in [6].

Problem 2: Let $U = S_1, S_2, S_3, S_4$ be a set of four students and C = Highest qualification, Knowledge, Previous experience, Hard work be the set of parameters, given by $P = P_1, P_2, P_3, P_4$. A set of three experts $E = \{e_1, e_2, e_3\}$

want to evaluate the best student as per knowledge base. The fuzzy decision matrices of experts e_1, e_2, e_3 are given in the following table. The fuzzy soft matrices of four students are given by X, Y and Z,

$$X = \begin{vmatrix} 0.8 & 0.7 & 0.5 & 0.9 \\ 0.4 & 0.3 & 0.8 & 0.4 \\ 0.6 & 0.4 & 0.2 & 0.6 \\ 0.7 & 0.6 & 0.6 & 0.7 \end{vmatrix}, Y = \begin{vmatrix} 0.7 & 0.6 & 0.6 & 0.8 \\ 0.3 & 0.3 & 0.4 & 0.4 \\ 0.5 & 0.5 & 0.7 & 0.6 \\ 0.6 & 0.6 & 0.9 & 0.6 \end{vmatrix}, \ and Z = \begin{vmatrix} 0.1 & 0.8 & 0.2 & 0.9 \\ 0.8 & 0.3 & 0.9 & 0.4 \\ 0.3 & 0.5 & 0.6 & 0.7 \\ 0.5 & 0.6 & 0.4 & 0.8 \end{vmatrix}$$

Solution: The problem is going to be solved by the proposed method: **Step-1:** The Expert Fuzzy Soft Matrices are as follows:

$$X = \begin{vmatrix} 0.8 & 0.7 & 0.5 & 0.9 \\ 0.4 & 0.3 & 0.8 & 0.4 \\ 0.6 & 0.4 & 0.2 & 0.6 \\ 0.7 & 0.6 & 0.6 & 0.7 \end{vmatrix}, Y = \begin{vmatrix} 0.7 & 0.6 & 0.6 & 0.8 \\ 0.3 & 0.3 & 0.4 & 0.4 \\ 0.5 & 0.5 & 0.7 & 0.6 \\ 0.6 & 0.6 & 0.9 & 0.6 \end{vmatrix}, \ and Z = \begin{vmatrix} 0.1 & 0.8 & 0.2 & 0.9 \\ 0.8 & 0.3 & 0.9 & 0.4 \\ 0.3 & 0.5 & 0.6 & 0.7 \\ 0.5 & 0.6 & 0.4 & 0.8 \end{vmatrix}$$

Step-2: The Mean Score Fuzzy Soft Matrices are as follows:

$$\bar{X} = \begin{vmatrix} 0.725 \\ 0.475 \\ 0.600 \\ 0.650 \end{vmatrix}, \bar{Y} = \begin{vmatrix} 0.675 \\ 0.350 \\ 0.575 \\ 0.675 \end{vmatrix}, \ and \ \bar{Z} = \begin{vmatrix} 0.500 \\ 0.600 \\ 0.525 \\ 0.575 \end{vmatrix}$$

Step-3: TheDecision Fuzzy Soft Matrix is

$$\begin{vmatrix} 0.633 \\ 0.475 \\ 0.567 \\ 0.633 \end{vmatrix}$$

Step-4: From the Decision Fuzzy Soft Matrix, two students S_1 and S_4 have got the same maximum grade which is 0.633. **Step-5:** Now we are going to find the CV for the students S_1 and S_4 Here $\bar{S_1} = \bar{S_4} = 0.633$

$$\begin{aligned} \sigma(S_1) &= \sqrt{\frac{\sum X^2}{N} - \left(\frac{\sum X}{N}\right)^2} \\ &= \sqrt{\frac{(0.725)^2 + (0.675)^2 + (0.5)^2}{3} - \left(\frac{0.725 + 0.675 + 0.5}{3}\right)^2} \\ &= \sqrt{\frac{0.526 + 0.456 + 0.25}{3} - \left(\frac{0.725 + 0.675 + 0.5}{3}\right)^2} \\ &= \sqrt{0.411 - 0.401} = 0.1 \end{aligned} \tag{4.1}$$

$$\begin{aligned} CV(S_1) &= \frac{\sigma}{\bar{S_1}} \times 100 \\ &= \frac{0.1}{0.633} \times 100 \\ &= 0.158 \times 100 \\ &= 15.8\% \end{aligned} \tag{4.2}$$

$$\begin{aligned}\sigma(S_4) &= \sqrt{\frac{\sum X^2}{N} - \left(\frac{\sum X}{N}\right)^2} \\ &= \sqrt{\frac{(0.65)^2 + (0.675)^2 + (0.575)^2}{3} - \left(\frac{0.65 + 0.675 + 0.575}{3}\right)^2} \\ &= \sqrt{\frac{0.423 + 0.456 + 0.331}{3} - \left(\frac{0.65 + 0.675 + 0.575}{3}\right)^2} \\ &= \sqrt{0.403 - 0.401} = 0.045\end{aligned} \tag{4.3}$$

$$\begin{aligned}CV(S_4) &= \frac{\sigma}{\bar{S}_4} \times 100 \\ &= \frac{0.045}{0.633} \times 100 \\ &= 0.071 \times 100 \\ &= 7.1\%\end{aligned} \tag{4.4}$$

It is clear that, the CV of S_4 is much less than the CV of S_1.This indicates the student S_4 is much better than the student S_1.

Hence S_4 is the best student as per the knowledge base.

5 Conclusion

We have proposed a method in decision making by using the concept of fuzzy soft matrix and their operations in this paper. Also we have solved two problems by using this method and found this method perform correctly to provide the best result with in a very short time.

References

[1] D. Molodtsov, Soft set theoryfirst results, Computers and Mathematics with Applications 37 (1999) 1931.

[2] NaimCagman, SerdarEnginoglu, Soft matrix theory and its decision making, Computers and Mathematics with Applications 59(2010), pp. 3308- 3314.

[3] N. Cagman and S. Enginoglu, Fuzzy soft matrix theory and its application in decision making, Iranian Journal of Fuzzy Systems, 9(1), (2012), pp. 109-119.

[4] L.A. Zadeh, Fuzzy sets, Inform. Control 8 (1965) 338353.

[5] ManashJyoti Borah, TridivJyotiNeog, Dusmanta Kumar Sut, Fuzzy soft matrix theory and its decision making , IJMER, 2(2) (2012), pp.121-127.

[6] M.J. Borah, T.J. Neog and D.K.Sut, Fuzzy soft matrix theory and its decision making, International Journal of Modern Engineering Research , 2 (2012) 121-127.

[7] K. Atanassov. Intuitionistic fuzzy sets. Fuzzy Sets and Systems 20, 87-96, (1986).

[8] W.L. Gau and D.J. Buehrer. Vague sets. IEEE nans. System Alan Cybemet 23 (2), 610-614, (1993).

[9] Pawlak, Rough sets, International Journal of Injonation and Computer Sciences 11, 341-356, (1982).

[10] P. K.Maji , A. R. Roy, A fuzzy soft set theoretic approach to decision making problems, Journal of Computational and Applied Mathematics, 203(2007), pp. 412 418.

[11] T.J. Neog, .Manoj Bora and D.K.Sut, On Fuzzy soft matrix theory , International Journal of Mathematical

Achieve-3(2) (2012) 491-500.

[12] P.K. Maji et al., (2001), Fuzzy Soft Sets, Journal of Fuzzy Mathematics, Vol. 9, No. 3, Pp. 589602.

[13] A. M. Ibrahim , A. O.Yusuf, Development of Soft Set Theory , American International Journal of Contemporary Research , Vol. 2 No. 9; September 2012

[14] Maji, P.K., Biswas, R. and Roy, A.R.(2003). Soft set theory, Computers and mathematics with applications. 45, 555-562.

[15] P.K. Maji et al., (2001), Fuzzy Soft Sets, Journal of Fuzzy Mathematics, Vol. 9, No. 3, Pp. 589602.

[16] Md. Jalilul Islam Mondal, Dr.TapanKumer Roy, Theory of a Fuzzy Soft Matrix and its Multi Criteria in Decision Making Based on Three Basic t-Norm Operators, International Journal of Innovative Research in Science , Engineering and Technology, vol. 2,Issue 10, October ,2013

[17] Douglas A. Lind, William G.Marchal, Samuel A.Wathen, Statistical Techniques in Business and Economics.(14th edition)

[18] Richard I. Levin, David S.Rubin,Statistics for Management.