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Original Research Article

FUZZY SOFT SET AND ITS APPLICATION IN MATRIX

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Abstract
Fuzzy soft set theories are represents as a general mathematical tool for dealing with contain decision making problems. The aim of this paper is to elaborate fuzzy soft set theory and evaluate the different type of matrix application in terms of Fuzzy soft set. Matrix application reduce the uncertainty for make decision in critical condition.

Keywords:- Fuzzy soft set, Matrix application, Uncertainty.

INTRODUCTION

From the information soft set theory is generally used to solve such problem. Since there is hardly and limitation in describing the objects, researchers simplify the decision making process by selecting the form of parameters they require and subsequently makes it more partial information method for solving soft set based decision making problems using several operation. (Maji *et.al.* 2002) In this results have defined different types of soft matrix it may solve any soft set based decision making problem involving huge number of decision makers. After Molodtsov, Maji *et al.* (2003) gave the operations of soft sets and their properties, he started to develop basics of the the corresponding theory as a new approach for modeling uncertainties. After Molodtsov's work, some different operations and application of soft sets were studied by Chen *et al.* (2005) and Maji *et al.* (2003). Furthermore Maji et al. (2002) presented the definition of fuzzy soft set as a generalization of Molodtsov's soft set. In Çağman *et al.* (2010) introduced the concept of fuzzy parameterized fuzzy soft sets and their operations. They introduced the concept of fuzzy parameterized interval-valued fuzzy soft set, where the mapping in which the approximate functions are defined from fuzzy parameters set.

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Definition of Fuzzy Soft Set

Mathematical developments have advanced to a very high standard and are still forthcoming today. The basic mathematical framework of fuzzy soft set theory will be described, as well as the most useful applications of this theory to other theories and techniques. The fuzzy parameters such as membership functions of the involved fuzzy variables must be tuned according to the knowledge base information; i.e, predicted data samples.

Let (SA, S) be fuzzy soft set over U. Then U×S defined as

$$RA= \{(U, S): S\in A, U\in SA\}$$

Where RA is known as the relation of fuzzy set (SA, S) and is defined as in the form of matrix.

$$[a_{ij}] = \begin{bmatrix} S_{11} & S_{12} & \cdots\cdots\cdots & S_{1n} \\ S_{21} & S_{22} & \cdots\cdots\cdots & S_{2n} \\ \cdots & \cdots & \cdots\cdots\cdots & \cdots \\ S_{m1} & S_{m2} & \cdots\cdots\cdots & S_{mn} \end{bmatrix}$$

This is known as soft matrix of order m×n corresponding to the soft set (S_A, S) over U.

For example: Let us suppose that the universe set U contains five bages b_1, b_2, b_3, b_4, b_5 and parameter set.

E= {costly, beautiful, cheap, comfortable, gorgeous} = {c_1, c_2, c_3, c_4, c_5}.

Let A= {c_1, c_2, c_3, c_4, c_5} C E and F: A= p(U) soft set.

$$F(c_1) = \left\{\frac{c_1}{0.8}, \frac{c_2}{0.3}, \frac{c_3}{0.6}, \frac{c_4}{0.5}, \frac{c_5}{0.2}\right\}$$

$$F(c_2) = \left\{\frac{c_1}{0.8}, \frac{c_2}{0.2}, \frac{c_3}{0.5}, \frac{c_4}{0.4}, \frac{c_5}{0.1}\right\}$$

$$F(c_3) = \left\{\frac{c_1}{0.3}, \frac{c_2}{0.7}, \frac{c_3}{0.5}, \frac{c_4}{0.4}, \frac{c_5}{0.9}\right\}$$

$$F(c_4) = \left\{\frac{c_1}{0.8}, \frac{c_2}{0.6}, \frac{c_3}{0.4}, \frac{c_4}{0.2}, \frac{c_5}{0.7}\right\}$$

$$F(c_{51}) = \left\{\frac{c_1}{0.5}, \frac{c_2}{0.2}, \frac{c_3}{0.8}, \frac{c_4}{0.3}, 0\right\}$$

And the relation form of (F:A) is written.

$$(a_{ij}) = \begin{bmatrix} 0.8 & 0.8 & 0.3 & 0.8 & 0.5 \\ 0.3 & 0.2 & 0.7 & 0.6 & 0.2 \\ 0.6 & 0.5 & 0.5 & 0.4 & 0.8 \\ 0.2 & 0.1 & 0.9 & 0.7 & 0 \end{bmatrix}$$

Now construct a decision making method on Fuzzy soft relation by the following algorithm;

1. Construct a feasible fuzzy subset.
2. Construct a Fuzzy soft set A over U,
3. Construct a Fuzzy soft relation according to the requests,
4. Calculate the fuzzification operator,
   Select the objects from matrix, which have the largest membership value.

Type of Matrices

1. **Row fuzzy soft matrix**: - A fuzzy soft matrix is called row fuzzy soft matrix of the matrix of order l×n i:e with a single row is called a row fuzzy soft matrix.
2. **Column fuzzy soft matrix**: - A fuzzy soft matrix of order m×l i;e, with a single column is called fuzzy soft column matrix.
3. **Square fuzzy soft matrix**: - A` fuzzy soft matrix of order m×n is called square fuzzy soft matrix.
4. **Null fuzzy soft matrix**: - A fuzzy soft matrix of order m×n is called a null fuzzy soft matrix of its elements is zero.
5. **Absolute fuzzy soft matrix**: - A fuzzy soft matrix of order m×n is called absolute fuzzy soft matrix is its all elements are one.
6. **Diagonal fuzzy soft matrix**:-A square fuzzy soft matrix of order m×n is called a diagonal fuzzy soft matrix if non diagonal elements are zero.
7. **Transpose of a fuzzy soft matrix**: -The transpose of a square matrix of order m×n is another square fuzzy soft matrix of order n×m is obtained form (a_{ij}) became a_{ji}, is called transpose of a fuzzy soft matrix it is denoted by $(a_{ij})^T=a_{ij}$.
8. **Symmetrix fuzzy soft matrix**: - A square fuzzy soft matrix of order m×n is called symmetrix fuzzy soft matrix if its transpose be equal i;e A^T=A.
9. **Addition of fuzzy soft matrix**: - Two fuzzy soft matrix A and B are said to be addition of fuzzy soft matrix if the matrix(a_{ij}) and (b_{ij}) of order m×n is define by

   $$A_{ij} \oplus b_{ij} = c_{ij},$$

   where c_{ij} is also an mxn fuzzy soft matrix.

10. **Subtraction of fuzzy soft matrix**:-Any two fuzzy soft matrix(aij) and(bij) of order mxn, Then it is define as (aij) ⊖ (bij)=cij ,where cij is also mxn order matrix.
11. **Properties of fuzzy soft matrix**

    A ⊕ Ao = CA

    A ⊖ Ao = ϕ
12. **Product of fuzzy soft matrix:-** If A and B are two fuzzy soft matrix then product AB is defined as

$$AB= \{(a_{ij})_{mxn} \otimes (b_{jk})_{nxp}=(c_{ik})_{mxp}\}$$

Expected Outcome

This is crucial in this post modern era characterized by fragmentation of the matrix and ascendancy of approximate reasoning. In addition, the complete description of a real system would often require far more detailed data than a human being could ever found simultaneously, process, and understand. On the other hand, matrix application have been found useful for dealing with problems in different areas of applied mathematics and engineering sciences, as the fuzzy soft et theory provides a algebraic framework which converted into matrix model for modeling and investigating the key factors in uncertainty problems. As already noted, a fuzzy logic system is a nonlinear system that crisp input vector into a crisp scalar output. When solving a large number of different matrix and uncertainty problems, this is what actually done on matrix application.

Conclusion

In this paper fuzzy soft set theory discus and defined different types of fuzzy soft matrices. Uncertainty problem will be reduced by matrix application. Also defined relations on Fuzzy soft sets and studied some of their properties and type of matrix. To extend this work, one could generalize it to fuzzy soft set theory in engineering and medical multi objective problem.

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