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Original Research Article

OVERVIEW OF SOFT SET THEORY ON UNCERTAINITY PROBLEM

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Abstract
There are lots of cases those are create uncertain problem which make confusion to take decision. Soft set theory is introduced to make decision under such uncertain condition. Soft set theory was represents as a general mathematical tool for dealing with contain uncertainties problems. The aim of this work is to define special kinds of soft sets to use them in order to give an alternative characterization of categories related to solve uncertain problem. Decision making methods on soft set theory will provide to take decision in uncertain problem by considering 2 cases problem that contain Uncertainty.

Key Word: - Soft set Theory, Uncertainty, and Fuzzy Set.

INTRODUCTION

The present expository paper is a condensation of part of the dissertation. Set theory is a basis of modern mathematics, and notions of set theory are used in all formal descriptions. The presentation of the rest of the paper is organized as follows. In the next section, most of the fundamental definitions of the operations of fuzzy sets and soft sets are presented. This paper concerns soft set theory systems of set theory where, given any predicate A, one may form the set { x | A } of sets satisfying A. 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. The aim of this notion was to make a certain discretization of such fundamental mathematical concepts with essentially continuous nature as a limit, continuity, a derivative, an integral, etc., thus providing new tools for the use of the machinery of mathematical analysis in applications. Specifically, the specialists found the concept of a soft set well coordinated with such modern mathematical concepts as a fuzzy set and a more general, multi-valued set. These ideas have resulted in a series of works where soft versions of fuzzy mathematical concepts were realized. In 1999 Molodtsov (1999) initiated a novel concept of soft set theory as a new mathematical tool for dealing with uncertainties. After Molodtsov's work, some different operations

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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. Roy and Maji (2001) gave an application of this concept in decision making problem. In Çağman et al. (2010) introduced the concept of fuzzy parameterized fuzzy soft sets and their operations. Alkhazaleh et al. (2012) generalized the concept of fuzzy soft set to possibility fuzzy soft set and they gave some applications of this concept in decision making and medical diagnosis. They also 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 to the interval-valued fuzzy subsets of universal set, and gave an application of this concept in decision making.

Most of our real life problems in engineering, social and medical science, economics, environment etc. involve imprecise data and their solutions involve the use of mathematical principles based on uncertainty and imprecision. To handle such uncertainties, a number of theories have been proposed. Some of these are probability, fuzzy sets, intuitionist fuzzy sets, interval mathematics and rough sets etc. Soft set is a parameterized general mathematical tool which deals 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 defines 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 this work. In soft set theory the problem is deal with to make decision on uncertain condition.

Set Theory

The membership criteria for a set must in principle be well-defined, and not vague. Consider a set and an object, it is possible that we do not know whether this object belongs to the set or not, because of our lack of information or knowledge. But the answer should exist, at any rate in principle. It could be unknown, but it should not be vague.

Laws of Set Theory

There are a number of general laws about sets which follow from the definitions of set theoretic operations, subsets, etc. They are grouped under their traditional names. These equations below hold for any sets X, Y, Z:

1. Idempotent Laws
(a) X ∪ X = X
(b) X ∩ X = X

2. Commutative Laws
(a) X ∪ Y = Y ∪ X
(b) X ∩ Y = Y ∩ X

3. Associative Laws
(a) (X ∪ Y) ∪ Z = X ∪ (Y ∪ Z)
(b) (X ∩ Y) ∩Z = X ∩ (Y ∩ Z)

4. Distributive Laws
(a) X ∪ (Y ∩ Z) = (X ∪ Y) ∩ (X ∪ Z)
(b) X ∩ (Y ∪ Z) = (X ∩ Y) ∪ (X ∩ Z)

5. Identity Laws
(a) X ∪ | = X
(b) X ∪ U = U
(c) X ∩ | = X
(d) X ∩ U = X

6. Complement Laws
(a) X ∪ X' = U
(b) (X')' = X
(c) X ∩ X' = X
(d) X – Y = X ∩ Y'

7. DeMorgan's Laws
(a) (X ∪ Y)' = X' ∩ Y'
(b) (X ∩ Y)' = X' ∪ Y'

8. Consistency Principle
(a) X ⊆ Y iff X ∪ Y = Y
(b) X ⊆ Y iff X ∩ Y = X

Soft Set

The concept of a soft set is sometimes compared to the concept of a fuzzy set, or more generally, to the concept of an L-fuzzy set. Indeed, these concepts have some unifying features. Both of them were "invented" to make "a revision" of the classical fundamental mathematical concept of a set in order to make it more suitable for representing applied problems, in particular, to deal with ill-posed problems, and to improve mathematical models for processes inherently having uncertainty in their description. Moreover, there is also obvious similarity in the formal definitions of soft sets and L-fuzzy sets. Indeed, let $A : U \to L$ be an L-fuzzy subset of a set U. Defining for each $\alpha \in L$ a subset $A\alpha = \{x \mid A(x) \geq \alpha\} \subseteq X$ we obtain a level decomposition called the horizontal representation [5] of the fuzzy set A:

$$A : U \to L \Longleftrightarrow \{A\alpha \mid \alpha \in L\}$$

Case 1 [1]

Let U be an initial universe, P(u) the power set of U, E is a set of parameters and A ⊆ E. Then, a soft set fA over U is defined as follows:

$$fA = \{(x, fA(x)) : x \in E\},$$

Where $fA : E \to P(u)$ is such that $fA(x) = \theta$ if x /∈ A.

Here, fA is called the approximate function of the soft set FA, and the value fA(x) is a set called the x-element of the soft set for all x ∈ E. It is worth noting that the sets fA(x) may be arbitrary.

Case 2 [2]

Let U be a universe. Then a fuzzy set A over U is a function defined as follows:

$$A = \{(\mu A(u)/u) : u \in U\},$$

Where $\mu A : U \to [0, 1]$.

Here, μA is called the membership function of A, and the value μA(u) is called the grade of membership of u ∈ U. This value represents the degree of u belonging to the fuzzy set A.

Soft Linear Logic

Light logics have been very successful in capturing the polytime functions; they suffer from the presence of the modality, meaning that light logics are not subsystems of Linear Logic. Soft Linear Logic Lafont (2004) is another logic which captures polynomial time functions. Unlike Light Linear Logic, it is a fragment of linear logic (that is, it does not include the paragraph modality), and additionally it has a very simple sequent calculus presentation. Lafont gives a system of proof nets for this logic, and demonstrates that each net reduces to a unique normal form in polynomials bounded number of bound has degree given by the nesting of exponentials in the proof net. The relationship between these areas has naturally become particularly close. Certainty eventually indicates that the assume structures and parameters of the model to be definitely known and that there are no doubts about their values or their occurrence.

Fuzzy set Theory

Mathematical developments have advanced to a very high standard and are still forthcoming today. The basic mathematical framework of fuzzy set theory will be described, as well as the most useful applications of this theory to other theories and techniques. The theory of neural networks and the area of evolutionary programming have become known under the name of ‘computational intelligence’ or ‘soft computing’ since 1992 fuzzy set theory. The relationship between these areas has naturally become particularly close. 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. Certainty eventually indicates that assumed the structures and parameters of the model to be known and that there are no queries about their values or their occurrence. These assumptions and beliefs are not justified if it is important, that the model describes well reality (which is neither crisp nor certain). 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.

Expected outcome Mathematical programming under fuzziness provides a corpus of scientific knowledge that permits to scope effectively with vagueness instead of merely thwarting, suppressing or downplaying it. Freud told us that the history of science is the history of alienation. Since Copernicus we no longer live at the centre of the universe; since Freud himself, conscience is just the emerged part of a complex reality hidden from us. Paraphrasing Freud, we can say since Zadeh we are no longer forced to approximate real problems of the more-or-less type by yes-or-no type models. This is crucial in this postmodern era characterized by fragmentation of the truth and ascendancy of approximate reasoning. Among lines for further development in the field of mathematical programming under fuzziness we may mention the following.

- Extension of the soft set cases so as to develop Fuzzy and Fuzzy stochastic cases so as to develop decision making capacity.
- Deep comparison of soft set theory makes strong Optimization techniques.
- Soft set efficiency in dealing with uncertainty problems is as a result of its parameterized concept.

This may help to design a user friendly Decision Support System able to help a Decision maker confronted with a problem of optimization under fuzziness.

Conclusion

After giving most of the fundamental definitions of soft set theory needed to develop applications of uncertainity in soft theory and studied their properties. Develop defined decision making methods by soft set theory and also give an application which shows that they can be successfully applied to problems that contain uncertainties. In the future, this theory can be applied on such as fuzzy sets and uncertain object. To extend this work, one could generalize it to fuzzy soft set theory, multi set theory and soft multi set theory.

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