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Related Study of Soft Set and Its Application A Review

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Abstract
In the present paper some literature related to soft sets are collected. The literature is motivated by Molodsov.

1. Introduction

Researcher deals the complexity of uncertain data in many fields such as economics, engineering, environment science, sociology, medical science etc. In 1999, Molodtsov initiated the novel concept of soft set as a new mathematical tool for dealing with uncertainties. Molodsov (1999) proposed a completely new approach for modelling vagueness and uncertainty in soft set theory. Soft set theory is free from the difficulties where as other existing methods viz. Probability Theory, Fuzzy Set Theory [Zadeh, 1965; Zimmerman, 1996], Intuitionistic fuzzy set theory [Atanassov, 1986], Rough Set Theory [Pawlak, 1982] etc. which can be considered as mathematical tools for dealing with uncertainties, have their own difficulties. Probability theory is applicable only for stochastically stable system. Interval mathematics is not sufficiently adaptable for problems with different uncertainties. Setting the membership function value is always been a problem in fuzzy set theory. Moreover all these techniques lack in the parameterization of the tools and they could not be applied successfully in tackling problems. It is further pointed out that the reason for these difficulties is, possibly, the inadequacy of the parameterization tool of the theory. There is no limited condition to the description of objects; Many of the established paradigms appear as special cases of Soft Set Theory, so researchers can choose the form of parameters they need, which greatly simplifies the decision making process and make the process more efficient in the absence of partial information. In 2003,Maji et al., studied the theory of soft sets initiated by Molodstov, they defined equality of two soft sets, subset and super set of a soft set, complement of a soft set, , null soft set and absolute soft set with examples. Soft binary operations like AND, OR and also the operations of union, intersection were also defined. In 2005, Pei & Miao and Chen et al., improved the work of Maji et al., (2002; 2003)**.** In 2009, Ali et al., gave some new notions such as the restricted intersection, the restricted union, the restricted difference and the extended intersection of two soft sets along with a new notion of complement of a soft set. Similarity measures have extensive application in pattern recognition, region extraction, coding theory, image processing and in many other areas. Presently, work on the soft set theory is making progress rapidly. In the standard soft set theory, a situation may be complex in the real world because of the fuzzy nature of the parameters. With this point of view Yang et al., (2007), expanded this theory to fuzzy soft set theory and discussed some immediate outcomes. To continue the investigation on fuzzy soft sets, Kharal & Ahmad (2011) introduced the notion of a mapping on the classes of fuzzy soft sets which is a pivotal notion for the advanced development of any new area of mathematical sciences. Similarity of two fuzzy soft sets has been studied by Majumdar & Samanta (2011) and application of similarity between generalized fuzzy soft sets has been studied by them in Majumdar & Samanta (2010). The algebraic structure of soft set theory has been studied increasingly in recent years. In this paper, studying the concept of soft set theory, types of soft set development and review its existing literature.

2. Motivation

Due to the usefulness of fuzzy sets and soft sets in the field of engineering, sciences, social science, medical science and many other field and its efficiency in dealing with uncertainty problems is as a result of its parameterized concept we should have to work on it.

3. Objectives And scope

To find some new results on fuzzy sets and soft set. It has following scope. Soft Sets represent a powerful tool for decision making about information systems, data mining and drawing conclusions from data, especially in those cases where some uncertainty exists in the data. To extend this work, one could generalize Expert set, Multi soft set theory, Rough Soft set, Type 2 fuzzy soft set and soft multi set theory.

4. A Brief Review Of The Work Done In The Field

Fuzzy set theory, which was firstly proposed by researcher Zadeh in 1965, has become a very important tool to solve problems and provides an appropriate framework for representing vague concepts by allowing partial membership. The origin of soft set theory could be traced to the work of Pawlak [1982; 1982A] in 1993 titled Hard sets and soft sets [Pawlak, 1994]. His notion of soft sets is a unified view of classical, rough and fuzzy sets. This motivated by Molodtsov in 1999 titled soft set theory: first result, there in, the basic notions of the theory of soft sets and some of its possible applications were presented.

In 1996 Lin have present a set theory for soft computing and presenting unified view of fuzzy sets via neighborhoods. This paper proposed fuzzy sets should be abstractly defined by such structures and are termed soft sets (sofsets). Based on such structures, W-sofset, F-sofset, P-sofset, B-sofset, C-sofset, N-sofset, FP-sofset, and FF-sofsets have been identified. Maji et al., (2001) presented a combination of fuzzy and soft set theories, fuzzy soft set theory is a more general soft set model which makes descriptions of the objective world more general, realistic, practical and accurate in some cases of decision making. In 2003 again presented soft set theory with some implementation in their work. Roy & Maji (2007) presented a novel method of object recognition from an imprecise multi observer data in decision making problem. Pei & Miao (2005) have discussed the relationship between soft sets and information systems. It is showed that soft sets are a class of special information systems. After soft sets are extended to several classes of general cases, the more general results also show that partition - type soft sets and information systems have the same formal structures, and that fuzzy soft sets and fuzzy information systems are equivalent. Xiao et al., (2005), in his paper, an appropriate definition and method is designed for recognizing soft information patterns by establishing the information table based on soft sets theory and at the same time the solutions are proposed corresponding to the different recognition vectors.

In Mushrif et al., (2006) studied the texture classification via Soft Set Theory based in a Classification Algorithm. In Aktas & Cagman (2007) have introduces the basic properties of soft sets and compare soft sets to the related concepts of fuzzy sets and rough sets. In the same year, Kovkov et al., have presented the stability of sets given by constraints is considered within the context of the theory of soft sets.

Feng et al., (2008) extended the study of soft set to soft semirings. The notions of soft semirings, soft subsemirings, soft ideals, idealistic soft semirings and soft semi ring homomorphism were introduced, and several related properties were investigated. Jun (2008) have presented a new algebra method is Soft BCK/BCI-algebras and in Jun et al., (2008) apply the notion of soft sets by Molodtsov to commutative ideals of BCK-algebras, commutative soft ideals and commutative idealistic soft BCK-algebras are introduced, and their basic properties are investigated. Kong et al., (2008) presented a heuristic algorithm of normal parameter reduction. Furthermore, the normal parameter reduction is also investigated in fuzzy soft sets. Sun et al., (2008) presented the definition of soft modules and construct some basic properties using modules. Yao et al., (2008) presented the concept of soft fuzzy set and its properties. Xiao et al., (2008) in this paper data analysis approaches of soft sets under incomplete information is calculated by weighted-average of all possible choice values of the object, and the weight of each possible choice value is decided by the distribution of other objects. In Ali et al., (2009) gives some new notions such as the restricted intersection, the restricted union, the restricted difference and the extended intersection of two soft sets. Herawan et al., (2009) proposed an approach for visualizing soft maximal association rules which contains four main steps, including discovering, visualizing maximal supported sets, capturing and finally visualizing the maximal rules under soft set theory. Jun et al., (2009) applied the notion of soft sets to the theory of BCK/BCI- algebras and introduced soft sub algebras and then derived their basic properties with some illustrative examples. Jun & Park (2009) introduced the concept of soft Hilbert algebra, soft Hilbert abysmal algebra and soft Hilbert deductive algebra and investigated their properties. Yang et al., (2009) introduced the combination of interval-valued fuzzy set and soft set models. The complement, AND, OR operations, DeMorgan's, associative and distribution laws of the interval-valued fuzzy soft sets are then proved.

In A car et al., (2010) introduce the basic notions of soft rings, which are actually a parameterized family of subrings of a ring, over a ring Babitha & Sunil (2010), presented the concept of soft set relations are introduced as a sub soft set of the Cartesian product of the soft sets and many related concepts such equivalent soft set relation, partition, composition, function etc. Cagman & Enginoglu (2010) define soft matrices and their operations which are more functional to make theoretical studies in the soft set theory and finally construct a soft max-min decision making method which can be successfully applied to the problems that contain uncertainties and also improving several new results, products of soft sets and uni-int decision function [Cagman & Enginoglu, 2010A]. Feng et al., (2010) aim of this paper is providing a framework to combine fuzzy sets, rough sets, and soft sets all together, which gives rise to several interesting new concepts such as rough soft sets, soft rough sets, and soft–rough fuzzy sets. Feng et al., (2010A) aim of this paper to give deeper insights into decision making involving interval valued fuzzy soft sets, a hybrid model combining soft with interval valued fuzzy sets. Many authors works in different areas like Soft lattices [FuLi, 2010], bijective soft set [Gong et al., 2010], on soft mappings [Majumdar & Samanta, 2010A]. Majumdar & Samanta (2010) have further generalised the concept of fuzzy soft sets as introduced by Maji et al., (2003). Qin & Hong (2010), paper deals with the algebraic structure of soft sets and constructed lattice structures. It is proved that soft equality is a congruence relation with respect to some operations and the soft quotient algebra is established. Xiao et al., (2010), in his paper proposes the notion of exclusive disjunctive soft sets and studies some of its operations, such as, restricted/relaxed AND operations, dependency between exclusive disjunctive soft sets and bijective soft sets etc. Xu et al., (2010) introduce the notion of vague soft set which is an extension to the soft set and discuss basic properties of vague soft sets.

In Ali et al., (2011) studied some important properties associated with these new operations. A collection of all soft sets with respect to new operations give rise to four idempotent monoids. Alkhazaleh et al., (2011), in his paper, as a generalization of Molodtsov's soft set introduce the definitions of a soft multiset, its basic operations such as complement, union and intersection. Atagun & Sezgin (2011) introduces soft subfields of a field and soft submodule of a left R-module their related properties about soft substructures of rings, fields and modules are investigated. In this paper Babitha & Sunil (2011), Antisymmetric relation and transitive closure of a soft set relation are introduced and proposed Warshall's algorithm. Celik et al., (2011) have introduced the notion of soft ring and soft ideal over a ring and some examples are given. Also obtain some new properties of soft rings and soft ideals.

Feng et al., (2011A), presented to establish an interesting connection between two mathematical approaches to vagueness: rough sets and soft sets. Also define new types of soft sets such as full soft sets, intersection complete soft sets and partition soft sets. FuLi (2011) paper based on some results of soft operations, using the DeMolan's laws and give the distributive laws of the restricted union and the restricted intersection and the distributive laws of the union and the extended intersection. Ge & Yang (2011) paper investigated operational rules given by Maji et al., (2003) and Ali et al., [2009; 2011] and obtain some sufficient necessary conditions such that corresponding operational rules hold and give correct forms for some operational rules.

Ghosh et al., (2011) defined fuzzy soft ring and study some of its algebraic properties. Herawan & Deris (2011), a soft set approach for association rule mining have define the notion of regular and maximal association rules between two sets of parameters.

Jiang et al., (2011) extended fuzzy soft sets with fuzzy DLs, i.e., present an extended fuzzy soft set theory by using the concepts of fuzzy DLs to act as the parameters of fuzzy soft sets and define some operations for the extended fuzzy soft sets. Jun et al., (2011) present the notions of positive implicative soft ideals and positive implicative idealistic soft BCK-algebras are introduced, and their basic properties are derived. Kharal & Ahmad (2011) define the notion of a mapping on soft classes and study several properties of images and inverse images of soft sets supported by examples.

Lee et al., (2011) introduced implicative soft ideals in BCK-algebras and implicative idealistic soft BCK-algebras and related properties are investigated. Ozturk & Inna (2011) presented soft-rings and idealistic soft rings. Pal & Mondal (2011) defined soft matrices based on soft set and operations of soft matrices are defined like AND, OR, union, intersection etc. for soft matrices are investigated.

Sezgin & Atagun (2011) discussed basic properties of operations on soft sets such as intersection, extended intersection, restricted union and restricted difference and illustrated their interconnections between each other. Same author also introduce Soft groups and normalistic soft group [Sezgin & Atagun, 2011A]. Yang & Guo (2011) in this paper, the notions of anti-reflexive kernel, symmetric kernel, reflexive closure, and symmetric closure of a soft set relation are first introduced, respectively. Finally, soft set relation mappings and inverse soft set relation mappings are proposed.

Zhou et al., (2011) applied the concept of intuitionistic fuzzy soft sets to semigroup theory. In Karaaslan et al., (2012) defined concept of a soft lattice, soft sublattice, complete soft lattice, modular soft lattice, distributive soft lattice, soft chain and study their related properties. Min (2012) have studied the concept of similarity between soft sets, which is an extension of the equality for soft set theory. Singh & Onyeozili (2012) presented the main objective and clarify some conceptual misunderstandings of the fundamentals of soft set theory and investigate some distributive and absorption properties of operations on soft sets [Singh & Onyeozili, 2012A]. Singh & Onyeozili (2012B), in this paper established some new results related to distributive properties of AND ($\wedge$) and OR ($\vee$) operations with respect to operations of union, restricted union restricted intersection, extended intersection and restricted difference on soft sets. Xiao et al., (2012), this paper aims to extend classical soft sets to trapezoidal fuzzy soft sets based on trapezoidal fuzzy numbers. Xiao et al., (2012A), an integrated FCM and fuzzy soft set for supplier selection problem based on risk evaluation. This study first integrates the Fuzzy Cognitive Map (FCM) and fuzzy soft set model for solving the supplier selection problem.

Alhazaymeh et al., (2012), presented the innovative definition like the operations of union, intersection, OR and AND operators of soft intuitionistic fuzzy sets along with illustrative examples. Ali (2012), to discuss the idea of reduction of parameters in case of soft sets and studied approximation space of Pawlak associated with a soft set. Park et al., (2012) studied the equivalence soft set relations and obtain soft analogues of many results concerning ordinary equivalence relations and partitions. Sk Nazmul and Syamal Kumar Samanta introduce several notions, such as soft topological soft groups, soft topological soft normal subgroups, and soft topological soft factor groups, and to study their properties.

B. A. Ersoy, S. Onar, K. Hila, and B. Davvaz (2013) applied the concept of intuitionistic fuzzy soft sets to rings.The concept of intuitionistic fuzzy soft rings is introduced and some basic properties of intuitionistic fuzzy soft rings has given. Intersection, union,AND, andOR operations of intuitionistic fuzzy soft rings are defined. Further Dariusz Wardowski (2013) introduced a new notion of soft element of a soft set and establish its natural relation with soft operations and soft objects in soft topological spaces. Next, using the notion of soft element, they define, in a different way than in the literature, a soft mapping transforming a soft set into a soft set and provide basic properties of such mappings. The new approach to soft mappings enables us too btain the natural first fixed-point results in the soft set theory.

Hac J. Akta G. and Ferif Ozlu (2014) introduces order of the soft groups, power of the soft sets, power of the soft groups, and cyclic soft group on a group. They also investigate the relationship between cyclic soft groups and classical groups. In China Xiaolong Xin and Wenting Li (2014) initiate the study of soft congruence relations by using the soft set theory.The notions of soft quotient rings, generalized soft ideals and generalized soft quotient rings, are introduced, and several related properties are investigated. Also, they obtain a one-to-one correspondence between soft congruence relations and idealistic soft rings and a one-to-one correspondence between soft congruence relations and soft ideals. In particular, the first, second, and third soft isomorphism theorems are established, respectively. In International Journal of Fuzzy Mathematics and Systems J. Subhashinin and Dr. C. Sekar introduces soft pre T1 space in the soft topological spaces. The notations of soft pre interior and soft pre closure are generalized using these sets.

5. Proposed Methodology

SOFT SET- A soft set F_A over U is a set defined by a function F_A representing a mapping

$F_A: E \to P(U)$ *such that* $f_A(x) = \phi$ *; if* $x \notin A$

Here, f_A is called approximate function of the soft set F_A, and the value $f_A(x)$ is a set called x-element of the soft set for all $x \in E$. It is worth noting that the sets $f_A(x)$ may be arbitrary, empty, or have nonempty intersection. Thus a soft set over U can be represented by the set of ordered pairs

$$F_A = \{(x, f_A(x)): x \in E, f_A(x) \in P(U)\}.$$

Note that the set of all soft sets over U will be denoted by $S(U)$.

FUZZY SETS- Let U be a universe. A fuzzy set X over U is a set defined by a function μ_X representing a mapping

$$\mu_X : U \to [0; 1]$$

μ_X is called the membership function of X, and the value $\mu_X(u)$ is called the grade of membership of $u \in U$. The value represents the degree of u belonging to the fuzzy set X. Thus, a fuzzy set X over U can be represented as follows:

$$X = \{(\mu_X(u)/u) : u \in U; \mu_X(x) \in [0; 1]\}.$$

Note that the set of all the fuzzy sets over U will be denoted by $F(U)$.

FUZZY SOFT SET- An fs-set Γ_A over U is a set defined by a function γ_A representing a mapping

$$\gamma_A: E \to F(U) \text{ such that } \gamma_A(x) = \phi \text{ if } x \notin A:$$

Here, γ_A is called fuzzy approximate function of the fs-set Γ_A, and the value $\gamma_A(x)$ is a set called x-element of the fs-set for all $x \in E$. Thus, an fs-set Γ_A over U can be represented by the set of ordered pairs

$$\Gamma_A = \{(x, \gamma_A(x)) : x \in E, \gamma_A(x) \in F(U)\}.$$

Note that the set of all fs-sets over U will be denoted by $FS(U)$.

Expected Outcomes:-

We will find some new results on soft set. Some new results can be obtain for soft set**.** In soft set previous author has found matrix set. We can find the inverse of matrix of soft set and its property for soft set.

The new properties of fuzzy sets can also be stabilized. In soft sets previous author defined soft group, soft topology, we can find some new properties of soft field, soft vector space and it's property. Some results can be generalized in fuzzy soft sets.

We will find the application of soft set and fuzz in daily life as well as in medical sciences

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