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Smarandache- Soft Neutrosophic Near-Ring and Algorithms

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ABSTRACT

In this paper, we introduced Samarandache-2-algebraic structure of Soft Neutrosophic Near-ring namely Smarandache –Soft Neutrosophic Near-ring. A Samarandache-2-algebraic structure on a set N means a weak algebraic structure S_1 on N such that there exist a proper subset M of N, Which is embedded with a stronger algebraic structure S_2 ,stronger algebraic structure means satisfying more axioms, that is $S_1 << S_2$,by proper subset one can understand a subset different from the empty set, from the unit element if any , from the Whole set. We define Smarandache - Soft Neutrosophic Near-ring and construct its algorithms through soft neutrosophic (H,A) – subgroup,soft neutrosophic ideal,soft neutrosophic bi-ideal,soft neutrosophic quasi-ideal.For basic concept of near-ring we refer to G.Pilz and for soft neutrosophic algebraic structure we refer to Muhammed Shabir ,Mumtaz Ali,Munazza Naz, and Florentin Smarandache.

1.Introduction

In order that, New notions are introduced in algebra to better study the congruence in number theory by Florentin smarandache [2] .By <proper subset> of a set A we consider a set P included in A, and different from A ,different from empty set, and from the unit element in A-if any they rank the algebraic structures using an order relationship:

They say that the algebraic structures $S_1 << S_2$ if: both are defined on the same set;all S_1 laws are also S_2 laws; all axioms of an S_1 law are accomplished by the corresponding S_2 law; S_2 law accomplish strictly more axioms that S_1 laws, or S_2 has more laws than S_1 .

For example: Semi group<< Monoid <<group<< ring<<field, or Semi group<< to commutative semi group, ring<< unitary ring etc. They define a general special structure to be a structure SM on a set A, different from a structure SN, such that a proper subset of A is a structure, where SM << SN.In addition we have published [8,9,10,11,12,13].

2. Preliminaries

Definition 2.1

Let $\langle N\ UI\rangle$ be a neutrosophic near-ring and (F,A) be a soft set over $\langle N\ UI\rangle$.Then (F,A) is called soft neutrosophic near-ring if and only if $F(a)$ is a neutrosophic sub near-ring of $\langle N\ UI\rangle$ for all $a \in A$.

Definition 2.2

Let $K(I) = \langle KUI\rangle$ be a neutrosophic near-field and let (F,A) be a soft set over $K(I)$. Then (F,A) is said to be soft neutrosophic near-field if and only if $F(a)$ is a neutrosophic sub near-field of $K(I)$ for all $a \in A$.

Now we have introduced our basic concept, called **Smarandache–Soft Neutrosophic–Near Ring.**

Definition 2.3

A Soft neutrosophic –near ring is said to be Smarandache –soft neutrosophic –near ring, if a proper subset of it is a soft neutrosophic –near field with respect to the same induced operations.

Alternate Definition for **Smarandache–Soft Neutrosophic–Near Ring.**

Definition 2.4

If there exists superset of a soft neutrosophic –near field is a soft neutrosophic near-ring with respect to the same induced operations,then that Soft neutrosophic –near ring is said to be Smarandache –soft neutrosophic –near ring.

Definition 2.5

Let (F,A) be a soft neutrosophic near-ring over $\langle N \cup I\rangle$.A soft neutrosophic subgroup

(H ,A) of (F,A) is called (H,A)-subgroup if (F,A)(H,A) $\subset$ (H,A).

Definition 2.6

Let (F,A) is soft neutrosophic zero-symmetric near-ring.Then a soft neutrosophic subgroup (L_Q,A) of ((F,A),+) is a soft neutrosophic quasi-ideal of (F,A) if and only if $(L_Q,A)(F,A) \cap (F,A)\ (L_Q,A) \subset (L_Q,A)$.

Definition 2.7.

Let (F,A) be a soft Neutrosophic near –ring over $\langle NUI\rangle$,which is zerosymmetric.A subgroup (L_B,A) of (F,A) is a Soft Neutrosophic bi-ideal if and only if $(L_B,A)(F,A)(L_B,A) \subseteq (L_B,A)$.

3. Algorithms:

ALGORITHM: (Soft Nuetrosophic Near-ring).

Step 1 :

Consider a non-empty set N

Step 2:

Verify that N is a near-ring under '+' and '$*$' For check the following conditions

(i) Verify $n_1 + n_2 \in N$

(ii) Verify $(n_1 + n_2) + n_3 = n_1 +(n_2 +n_3)$

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(iii) Verify $(n_1 + e) = e = (e + n_1)$, $e \in N$.
(iv) Verify $n_1 + n_2 = n_2 + n_1 = e$
(v) Verify $n_1 + n_2 = n_2 + n_1$
(vi) Verify $n_1 * n_2 \in N$
(ii) Verify $(n_1 * n_2) * n_3 = n_1 *(n_2 * n_3)$

The above conditions are satisfied then verify $n_1 *(n_2 + n_3) = n_1 * n_2 + n_1 * n_3$

Step 3: If step 2 is verified then write (N,+,*) be near-ring

Step 4 : Consider a parameterized set A

Step 5 :Consider a neutrosophic set $\langle N \cup I \rangle = \{ n_1 + n_2 I ; n_1, n_2 \in N \}$,where I is the neutrosphic element.

Step 6: Construct the mapping F : A → P(U) ; $\langle N \cup I \rangle \in$ P(U),where P(U) is power set of Universal set.

Step 7: write (F,A) is soft neutrosophic near-ring $\langle N \cup I \rangle$,where F(x) is soft neutrosophic sub near ring,for all $x \in A$.

Algorithm: (Soft Neutrosophic Near-field).

Step 1 : Consider a set non empty M

Step 2:

Verify that M is a near-field under '+' and '*'

For check the following conditions

(i) Verify $m_1 * m_2 \in M$
(ii) Verify $(m_1 * m_2) * m_3 = m_1 *(m_2 * m_3)$
(iii)Verify $(m_1 * e) = e = (e * m_1)$, $e \in K$.
(iv) Verify $m_1 * m_2 = m_2 * m_1 = e$
(v) Verify $m_1 * m_2 = m_2 * m_1$

The above conditions are true for the operation '+' and '*' then verify $n_1 *(n_2 + n_3) = n_1 * n_2 + n_1 * n_3$

Step 3: If step 2 is verified then write (M,+,*) is a near-field

Step 4 : Consider a parameterized set A

Step 5 :Consider a neutrosophic set $\langle M \cup I \rangle = \{m_1 + m_2 I ; m_1, m_2 \in M\}$,where I is the neutrosphic element.

Step 6: Construct the mapping H: A → P(U) ; $\langle M \cup I \rangle \in$ P(U), where P(U) is power set of Universal set.

Step 7: write (H,A) is a soft neutrosophic near-field $\langle M \cup I \rangle$,where H(x) is soft neutrosophic subnear-field,for all $x \in A$.

Algorithm : (Smarandache- Soft Neutrosophic Near-ring).

Step 1 : Consider a set N

Step 2: Verify that N is a near-ring under '+' and '*'

For check the following conditions

(i) Verify $n_1 + n_2 \in N$
(ii) Verify $(n_1 + n_2) + n_3 = n_1 +(n_2 + n_3)$
(iii) Verify $(n_1 + e) = e = (e + n_1)$, $e \in N$.
(iv) Verify $n_1 + n_2 = n_2 + n_1 = e$
(v) Verify $n_1 + n_2 = n_2 + n_1$
(vi) Verify $n_1 * n_2 \in N$
(vii) Verify $(n_1 * n_2) * n_3 = n_1 *(n_2 * n_3)$

The above conditions are satisfied then verify $n_1 *(n_2 + n_3) = n_1 * n_2 + n_1 * n_3$

Step 3: If step 2 is verified then write (N,+,*) be near-ring

Step 4 : Consider a parameterized set A

Step 5 :Consider a neutrosophic set $\langle N \cup I \rangle = \{ n_1 + n_2 I ; n_1, n_2 \in N\}$,where I is the neutrosphic element.

Step 6: Construct the mapping F : A → P(U) ; $\langle N \cup I \rangle \in$ P(U), where P(U) is power set of Universal set.

Step 7: write (F,A) is soft neutrosophic near ring over $\langle N \cup I \rangle$,where F(x) is soft neutrosophic sub Near- ring,for all $x \in A$.

Step 8: Consider a set $M \subset N$

Verify that M is a near-field under '+' and '*'

For check the following conditions

(i) Verify $m_1 * m_2 \in M$
(ii) Verify $(m_1 * m_2) * m_3 = m_1 *(m_2 * m_3)$
(iii)Verify $(m_1 * e) = e = (e * m_1)$, $e \in K$.
(iv) Verify $m_1 * m_2 = m_2 * m_1 = e$
(v) Verify $m_1 * m_2 = m_2 * m_1$

The above conditions are true for the operation '+' and '•' then

Verify $m_1 \bullet (m_2 + m_3) = (m_1 \bullet m_2) + (m_1 . m_3)$

Step 9: If step 8 is verified then write (M,+,•) be near-field

Step 10: Consider a neutrosophic set $\langle M \cup I \rangle = \{ m_1 + m_2 I ; m_1, m_2 \in M\}$,where I is the neutrosphic element.

Step 11: Construct the mapping H: A → P(U) ; $\langle M \cup I \rangle \in$ P(U), where P(U) is power set of Universal set.

Step 12: write (H,A) is soft neutrosophic near--field over $\langle M \cup I \rangle$

Step 13: Verify (H,A) ⊂ (F,A)

Step14: If step13 is verified then write (F,A) is Smarandache-soft neutrosophic near-ring over $\langle N \cup I \rangle$.

4.Main Results

In Gunder pilz [4] in section 1.60(d).The Theorem by Gratzer and Fain is given the following conditions for a near-ring $N \neq \{0\}$ are equivalent

1. $\cap I \neq \{0\}$,$\{0\} \neq I \subseteq N$.
2. N contains a unique minimal ideal,contained in all other non-zero ideals .

Consequently the following conditions for a soft soft neutrosophic near-ring $(F,A) \neq \{0\}$ are equivalent

1. $\cap (L,A) \neq \{0\}$,$\{0\} \neq (L,A) \subseteq (F,A)$.
2. (F,A) contains a unique minimal soft neutrosophic ideal,contained in all other non-zero soft neutrosophic ideals .

Algorithm: (Soft Neutrosophic (H,A) –Subgroup)

Step 1:Consider a non-empty set M

Step 2: Verify that M is a near-field under '+' and *

For check the following conditions

(i) For all $m_1, m_2 \in M \Rightarrow m_1 + m_2 \in M$.
(ii) For all $m_1, m_2, m_3 \in M \Rightarrow m_1 + (m_2 + m_3) = (m_1 + m_2) + m_3$
(iii) For all $m \in M$,there exist $e \in M \Rightarrow e + m = m + e = m$
(iv) For all $m \in M$,there exist $m' \in M \Rightarrow m' + m = e$ $m + m' = e$

Let $M' = M / \{0\}$

(v) For all $m_1, m_2 \in M \Rightarrow m_1 * m_2 \in M'$.
(vi) For all $m_1, m_2, m_3 \in M' \Rightarrow m_1 * (m_2 * m_3) = (m_1 * m_2) * m_3$
(vii) For all $m \in M'$,there exist $e \in M' \Rightarrow e' + m = m + e' = m$
(viii) For all $m \in M'$,there exist $m' \in M \Rightarrow m' * m = m * m' = e'$
(ix) For all $m_1, m_2, m_3 \in M \Rightarrow (m_1 + m_2) * m_3 = m_1 * m_3 + m_2 * m_3$

The above conditions are satisfied write (M,+,*) is a near-field.

Step 3: Consider a parameterized set A

Step 4 :Consider a neutrosophic set $\langle M \cup I \rangle = \{m_1 + m_2 I ; m_1, m_2 \in M\}$,where I is the neutrosphic element.

Step 5: Construct the mapping H: A → P(U) ; $\langle M \cup I \rangle \in$ P(U), where P(U) is power set of Universal set

Step 6: we write (H,A) is soft neutrosophic near-field over $\langle M \cup I \rangle$

Step 7: Let $(H,A) = (H,A_0)$

Step 8: Let (H,A_i), i = 0,1,2…..n be supersets of (H,A_0)
Step 9: Let (F,A) be soft neutrosophic set over $\langle N \cup I\rangle$,where (F,A) $=\bigcup_{i=0}^{n}(H,A_i)$ and $\langle N \cup I\rangle = \bigcup_{i=0}^{n}\langle M_i \cup I\rangle$
Step 10: Choose sets (H,A_j)'s from (H,A_i)'s subject to for all F(a) in (F,A) and for all $H(a_j)$ in (H,A_j)
such that $(H,A_j)(F,A)$ in (H,A_j)
Step 11: Verify $\cap$ $(H,A_i) = (H,A_0) \neq \{0\}$
Step 12 : If step 11 is true,then write (F,A) is Smarandache -softneutrosophic near-ring over $\langle N \cup I\rangle$.

Algorithm: (Soft Neutrosophic Ideal)

Step 1:Consider a non-empty set M
Step 2: Verify that M is a near-field under '+' and *
For check the following conditions
(i) For all $m_1,m_2 \in M \Rightarrow m_1 + m_2 \in M$.
(ii) For all $m_1,m_2,m_3 \in M \Rightarrow m_1 + (m_2+m_3) = (m_1 + m_2) + m_3$
(iii) For all $m \in M$,there exist $e \in M \Rightarrow e + m = m + e = m$
(iv) For all $m \in M$,there exist $m' \in M \Rightarrow m' + m = e$ $m + m' = e$
Let $M' = M/\{0\}$
(v) For all $m_1,m_2 \in M \Rightarrow m_1 * m_2 \in M'$.
(vi) For all $m_1,m_2,m_3 \in M' \Rightarrow m_1 * (m_2 * m_3) = (m_1 * m_2) * m_3$
(vii) For all $m \in M'$,there exist $e \in M' \Rightarrow e' + m = m + e' = m$
(viii) For all $m \in M'$,there exist $m' \in M \Rightarrow m' * m = m * m' = e'$
(ix) For all $m_1,m_2,m_3 \in M \Rightarrow (m_1+m_2) * m_3 = m_1 * m_3 + m_2 * m_3$
The above conditions are satisfied write $(M,+,*)$ is a near-field.
Step 3: Consider a parameterized set A
Step 4 :Consider a neutrosophic set $\langle M \cup I\rangle$ $=\{m_1+m_2I ; m_1,m_2 \in M\}$,where I is the neutrosphic element.
Step 5: Construct a mapping H: A $\to$ P(U) ; $\langle M \cup I\rangle \in$ P(U) , where P(U) is power set of Universal set.
Step 6: write (H,A) is soft neutrosophic near-field over $\langle M \cup I\rangle$
Step 7: Let $(H,A) = (H,A_0) = (L,A_0)$
Step 8: Let (L,A_i), i = 0,1,2…..n be supersets of (L,A_0)
Step 9: Let (F,A) be soft neutrosophic set over $\langle N \cup I\rangle$,where (F,A) $=\bigcup_{i=0}^{n}(L,A_i)$
and $\langle N \cup I\rangle = \bigcup_{i=0}^{n}\langle M_i \cup I\rangle$
Step 10: Choose sets (L,A_j)'s from (L,A_i)'s subject to for all F(a) in (F,A) and for all $L(a_j)$ in (L,A_j)
such that $L(a_j)F(a)$ in (L,A_j)
Step 11: Verify $\cap$ $(L,A_i) = (L,A_0) \neq \{0\}$
Step 12 : If step 11 is true, then write (F,A) is Smarandache – soft neutrosophic near-ring over $\langle N \cup I\rangle$.

Algorithm : (Soft Neutrosophic Bi-Ideal)

Step 1:Consider a non-empty set M
Step 2: Verify that M is a near-field under '+' and *
For check the following conditions
(i) For all $m_1,m_2 \in M \Rightarrow m_1 + m_2 \in M$.
(ii) For all $m_1,m_2,m_3 \in M \Rightarrow m_1 + (m_2+m_3) = (m_1 + m_2) + m_3$
(iii) For all $m \in M$,there exist $e \in M \Rightarrow e + m = m + e = m$
(iv) For all $m \in M$,there exist $m' \in M \Rightarrow m' + m = e$ $m + m' = e$
Let $M' = M/\{0\}$
(v) For all $m_1,m_2 \in M \Rightarrow m_1 * m_2 \in M'$.
(vi) For all $m_1,m_2,m_3 \in M' \Rightarrow m_1 * (m_2 * m_3) = (m_1 * m_2) * m_3$
(vii) For all $m \in M'$,there exist $e \in M' \Rightarrow e' + m = m + e' = m$
(viii) For all $m \in M'$,there exist $m' \in M \Rightarrow m' * m = m * m' = e'$
(ix) For all $m_1,m_2,m_3 \in M \Rightarrow (m_1+m_2) * m_3 = m_1 * m_3 + m_2 * m_3$
The above conditions are satisfied write $(M,+,*)$ is a near-field.
Step 3: Consider the parameterized set A
Step 4 : Consider the neutrosophic set $\langle M \cup I\rangle$ $=\{m_1+m_2I ; m_1,m_2 \in M\}$,where I is the neutrosphic element.
Step 5: Construct the mapping H: A $\to$ P(U) ; $\langle M \cup I\rangle \in$ P(U), where P(U) is power set of Universal set
Step 6: write (H,A) is soft neutrosophic near-field over $\langle M \cup I\rangle$
Step 7: Let $(H,A) = (H,A_0) = (L_B,A_0)$
Step 8: Let (L_B,A_i), i = 0,1,2…..n be supersets of (L_B,A_0)
Step 9: Let (F,A) be soft neutrosophic set over $\langle N \cup I\rangle$,where (F,A) $=\bigcup_{i=0}^{n}(L_B,A_i)$
and $\langle N \cup I\rangle = \bigcup_{i=0}^{n}\langle M_i \cup I\rangle$
Step 10: Choose sets (L_B, A_j)'s from (L_B, A_i)'s subject to for all F(a) in (F,A) and for all $L_B(a_j)$ in (L_B,A_j)
such that (L_B,A_j) (F,A) (L_B,A_j) in (L_B,A_j)
Step 11: Verify $\cap$ $(L_B,A_i) = (L_B,A_0) \neq \{0\}$
Step 12 : If step 11 is true, then write (F,A) is Smarandache-soft neutrosophic near-ring over $\langle N \cup I\rangle$.

Algorithem : (Soft Neutrosophic Quasi-Ideal)

Step 1:Consider a non-empty set M
Step 2: Verify that M is a near-field under '+' and *
For check the following conditions
(i) For all $m_1,m_2 \in M \Rightarrow m_1 + m_2 \in M$.
(ii) For all $m_1,m_2,m_3 \in M \Rightarrow m_1 + (m_2+m_3) = (m_1 + m_2) + m_3$
(iii) For all $m \in M$,there exist $e \in M \Rightarrow e + m = m + e = m$
(iv) For all $m \in M$,there exist $m' \in M \Rightarrow m' + m = e$ $m + m' = e$
Let $M' = M/\{0\}$
(v) For all $m_1,m_2 \in M \Rightarrow m_1 * m_2 \in M'$.
(vi) For all $m_1,m_2,m_3 \in M' \Rightarrow m_1 * (m_2 * m_3) = (m_1 * m_2) * m_3$
(vii) For all $m \in M'$,there exist $e \in M' \Rightarrow e' + m = m + e' = m$
(viii) For all $m \in M'$,there exist $m' \in M \Rightarrow m' * m = m * m' = e'$
(ix) For all $m_1,m_2,m_3 \in M \Rightarrow (m_1+m_2) * m_3 = m_1 * m_3 + m_2 * m_3$
The above conditions are satisfied write $(M,+,*)$ is a near-field.
Step 3: Consider the parameterized set A
Step 4 :Consider the neutrosophic set $\langle M \cup I\rangle$ $=\{m_1+m_2I ; m_1,m_2 \in M\}$,where I is the neutrosphic element.
Step 5: Construct a mapping H: A $\to$ P(U) ; $\langle M \cup I\rangle \in$ P(U), where P(U) is power set of Universal set
Step 6: write (H,A) is soft neutrosophic near-field over $\langle M \cup I\rangle$
Step 7: Let $(H,A) = (H,A_0) = (L_Q,A_0)$
Step 8: Let (L_Q,A_i), i = 0,1,2…..n be supersets of (L_B,A_0)
Step 9: Let (F,A) be soft neutrosophic set over $\langle N \cup I\rangle$,where (F,A) $=\bigcup_{i=0}^{n}(L_Q,A_i)$ and $\langle N \cup I\rangle = \bigcup_{i=0}^{n}\langle M_i \cup I\rangle$
Step 10: Choose sets (L_Q, A_j)'s from (L_Q, A_i)'s subject to for all F(a) in (F,A) and for all $L_Q(a_j)$ in (L_Q,A_j) such that $(L_Q,A_j)(F,A) \cap (F,A)$ (L_Q,A_j) in (L_Q,A_j)
Step 11: Verify $\cap$ $(L_Q,A_i) = (L_Q,A_0) \neq \{0\}$
Step 12 : If step 11 is true, then write (F,A) is Smarandache-soft neutrosophic near-ring over $\langle N \cup I\rangle$.

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