Neutrosophic Simply Soft Open Set in Neutrosophic Soft Topological Space

Suman Das¹, and Surapati Pramanik²,*

¹Department of Mathematics, Tripura University, Agartala, 799022, Tripura, India.
Email: suman.mathematics@tripurauniv.in, sumandas18842@gmail.com
²Department of Mathematics, Nandalal Ghosh B. T. College, Narayanpur, 743126, West Bengal, India.
Email: sura_pati@yahoo.co.in

* Correspondence: sura_pati@yahoo.co.in Tel.: (+91-9477035544)

Abstract: In this paper, we introduce the notion of Neutrosophic Simply Soft Open (NSS-O) set, Neutrosophic Simply Soft (NSS) compact set in Neutrosophic Soft Topological Spaces (NSS-TS) and investigate several properties of it. Also, we furnish the proofs of some theorems associated with NSS-compact spaces. Then, the notion of neutrosophic simply soft continuous (NSS-continuous) mapping, NSS-O mapping on an NSS-TS and its properties are developed here.

Keywords: neutrosophic simply soft open, neutrosophic simply soft closed, neutrosophic simply soft compact, neutrosophic simply soft continuous.

1. Introduction

Maji (2012; 2013) grounded the idea of Neutrosophic Soft Set (NSS) by combining Neutrosophic Set (NS) (Smarandache, 1998) and Soft Set (Molodtsov, 1999). The impact of NS and NSS has been reflected in their applicability in decision making (Smarandache & Pramanik, 2016; 2018; Mondal, Pramanik, & Giri, 2018a; 2018b; 2018c; Biswas, Pramanik, & Giri, 2014a; 2014b; 2019; Pramanik, Mallick, & Dasgupta, 2018; Dalapati et al., 2017; Pramanik, Dalapati, Alam, Smarandache, Roy, 2018; Das et al., 2019; Dey, Pramanik, & Giri, 2015; 2016a; 2016b; Karaaslan, 2015; Pramanik & Dalapati, 2016; Pramanik, Dey, & Giri, 2016; Jha et al., 2019). Broumi (2013) further studied NSS and proposed generalized NSS by combining generalized neutrosophic set (Salama and Alblowi, 2012a) and soft set (Molodtsov, 1999). Smarandache (2018) generalized the soft set to the hypersoft set and plithogenic hypersoft set.

Das and Pramanik (2020) recently presented neutrosophic b-open sets in NTS. Mehmood et al. (2020) presented neutrosophic soft α–open set in NTS.

El Sayed, & Noaman (2013) presented the simply fuzzy generalized open and closed sets, simply fuzzy continuous mappings, simply fuzzy compactness, simply connectedness. In a neutrosophic soft set environment, these concepts have not been introduced.

**Research gap:** Investigations on Neutrosophic Simply Soft Open (NSS-O) set in NSS-TS, NSS-continuous mapping, NSS-O mapping, NSS-compactness on an NSS-TS have not been reported in the literature.

**Motivation:** Since NS generalizes fuzzy set (Zadeh, 1965) and NS is more suitable to deal with uncertainty including inconsistency and indeterminacy, we get the motivation to extend the simply fuzzy set in a neutrosophic environment. To address the research gap, we introduce the NSS-O set, NSS-compactness on an NSS-TS.

The rest of the paper is designed as follows:

Section 2 recalls of some definitions, properties of NSS-S, NSS-T, and NSS-TS. Section 3 introduces NSS-O set, NSS-compactness, and proofs of some theorems, propositions on NSS-TS. Also, in this section, we develop the concept of NSS-continuous mapping, NSS-O mapping. Finally, Section 4 presents concluding remarks.

2. Preliminaries and some properties

**Definition 2.1.** Assume that \( W \) is a non-empty fixed set and \( P \) is a collection of parameters. Assume that NS(\( W \)) denotes the set of all NSs over \( W \). Then, for any \( S \subseteq P \), a pair \((N, S)\) is said to be an NSS-S (Maji, 2012) over \( W \), where \( N: S \rightarrow \text{NS}(W) \) is a mapping. An NSS-S (\( N, S \)) is represented as follows:

\[
(N, S) = \{(f, (u, T_{NS}(u), I_{NS}(u), F_{NS}(u)): u \in W): f \in P\},
\]

where \( T_{NS}(u), I_{NS}(u), F_{NS}(u) \) are the truth, indeterminacy, and falsity membership values of each \( u \) w.r.t. the parameter \( f \in P \).

**Example 2.1.** Assume that \( W = \{m_1, m_2, m_3\} \) is a set consisting of three mobiles and \( P = \{f_1(\text{display}), f_2(\text{RAM}), f_3(\text{cost})\} \) be a set of parameters with respect to which the nature of mobile is described. Let,

\[
N(f_1) = \{(m_1, 0.6, 0.5, 0.5), (m_2, 0.3, 0.8, 0.5), (m_3, 0.5, 0.3, 0.4)\},
\]

\[
N(f_2) = \{(m_1, 0.7, 0.4, 0.6), (m_2, 0.6, 0.5, 0.4), (m_3, 0.7, 0.3, 0.3)\},
\]

\[
N(f_3) = \{(m_1, 0.8, 0.5, 0.4), (m_2, 0.7, 0.8, 0.5), (m_3, 0.5, 0.3, 0.6)\}.
\]

Then \((N, P) = \{(f_1, N(f_1)), (f_2, N(f_2)), (f_3, N(f_3))\}\) is an NSS-S over \( W \) w.r.t the set \( P \).

**Definition 2.2.** The complement of an NSS-S \((N, P)\) (Maji, 2012) is denoted by \((N^c, P)\) and is defined by \((N^c, P) = \{(f, (u, 1-T_{NS}(u), 1-I_{NS}(u), 1-F_{NS}(u)): u \in W)\}: f \in P\}.

**Definition 2.3.** Assume that \((S_1, P)\) and \((S_2, P)\) are any two NSS-Ss over \( W \). Then \((S_1, P)\) is said to be a neutrosophic soft subset (Maji, 2012) of \((S_2, P)\) if \( \forall f \in P \) and \( \forall u \in W, T_{S_1(f)}(u) \leq T_{S_2(f)}(u), I_{S_1(f)}(u) \leq I_{S_2(f)}(u), F_{S_1(f)}(u) \leq F_{S_2(f)}(u) \).
\[ \exists! s_t(f)(u), \text{ and } F_s(f)(u) \geq F_s(f)(u). \] We write \((S_t, P) \subseteq (S_z, P)\). Then \((S_z, P)\) is called the neutrosophic soft superset of \((S_t, P)\).

**Definition 2.4.** Assume that \((S_t, P)\) and \((S_z, P)\) be any two \(N^S\)-Ss over \(W\). Then their union (Maji, 2012) is denoted by \((H, P)\), where \(H = S_t \cup S_z\) and is defined as:
\[
(H, P) = \{ (f, ((u, T_{S_t}(u), I_{S_t}(u), F_{S_t}(u)); u \in W)) : f \in P \},
\]
where \(T_{S_t}(u) = \max \{ T_{S_z}(u), T_{S_z}(u) \}, \quad I_{S_t}(u) = \min \{ I_{S_z}(u) \text{ and } I_{S_z}(u) \}, \quad F_{S_t}(u) = \min \{ F_{S_z}(u), F_{S_z}(u) \} \).

**Definition 2.5.** Assume that \((S_t, P)\) and \((S_z, P)\) are any two \(N^S\)-Ss over \(W\). Then their intersection (Maji, 2012) is denoted by \((H, P)\), where \(H = S_t \cap S_z\) and is defined as:
\[
(H, P) = \{ (f, ((u, T_{S_t}(u), I_{S_t}(u), F_{S_t}(u)); u \in W)) : f \in P \},
\]
where \(T_{S_t}(u) = \min \{ T_{S_z}(u), T_{S_z}(u) \}, \quad I_{S_t}(u) = \max \{ I_{S_z}(u) \text{ and } I_{S_z}(u) \}, \quad F_{S_t}(u) = \max \{ F_{S_z}(u), F_{S_z}(u) \} \).

**Definition 2.6.** An \(\text{\(N^S\)-S} (S, P)\) over a non-empty set \(W\) is said to be a null \(\text{\(N^S\)-S} (Bera, \& Mahapatra, 2017)\) if \(T_{S_t}(u) = 0, I_{S_t}(u) = 1, F_{S_t}(u) = 1 \forall u \in W\) w.r.t. the parameter \(f \in P\). It is denoted by \(0_{\text{\(N^S\)-S}}\).

**Definition 2.7.** An \(\text{\(N^S\)-S} (S, P)\) over a non-empty set \(W\) is called an absolute \(\text{\(N^S\)-S} (Bera, \& Mahapatra, 2017)\) if \(T_{S_t}(u) = 1, I_{S_t}(u) = 0, F_{S_t}(u) = 0 \forall u \in W\) w.r.t. the parameter \(f \in P\). It is denoted by \(1_{\text{\(N^S\)-S}}\).

Clearly, \(I_{\text{\(N^S\)-S}} \subseteq \text{\(N^S\)-S}\) and \(0_{\text{\(N^S\)-S}} \subseteq \text{\(N^S\)-S}\). 

**Definition 2.8.** Assume that \(\text{\(N^S\)-S} (W, P)\) be the collection of all \(\text{\(N^S\)-Ss} over \(W\) via parameters in \(P\) and \(\tau \subseteq \text{\(N^S\)-S} (W, P)\). Then \(\tau\) is said to be an \(\text{\(N^S\)-T} (Bera, \& Mahapatra, 2017)\) on \((W, P)\) if the following axioms are satisfied.
\[(i) \quad 0_{\text{\(N^S\)-S}}, 1_{\text{\(N^S\)-S}} \in \tau;\]
\[(ii) \quad (R, P), (Q, P) \in \tau \Rightarrow (R \cap Q, P) \in \tau;\]
\[(iii) \quad ((Q, P), i \in A) \subseteq \tau \Rightarrow (\cup_{i \in A} Q, P) \in \tau.\]

The triplet \((W, P, \tau)\) is said to be an \(\text{\(N^S\)-TS}. \) Every element of \(\tau\) is called an \(\text{\(N^S\)-O set}. \) An \(\text{\(N^S\)-S} (S, P)\) is called a neutrosophic soft closed (\(\text{\(N^S\)-C})\) set iff its complement \((S', P)\) is an \(\text{\(N^S\)-O set}.\)

**Definition 2.9.** Assume that \((W, P, \tau)\) be an \(\text{\(N^S\)-TS over} (W, P)\) and \((M, P)\) be an arbitrary element of \(\text{\(N^S\)-S} (W, P)\). Then the neutrosophic soft interior (\(N^S_{\text{int}}\)) (Bera, \& Mahapatra, 2017) and neutrosophic soft closure (\(N^S_{\text{cl}}\)) of \((M, P)\) is defined as follows:
\[N^S_{\text{int}} (M, P) = \cup \{(Q, P); (Q, P) \text{ is an } \text{\(N^S\)-O set in } W \text{ and } (Q, P) \subseteq (M, P)\}.\]
\[N^S_{\text{cl}} (M, P) = \cap \{(Q, P); (Q, P) \text{ is an } \text{\(N^S\)-C set in } W \text{ and } (M, P) \subseteq (Q, P)\}.\]

**Proposition 2.1.** Assume that \((W, P, \tau)\) be an \(\text{\(N^S\)-TS over}\ (W, P)\) and \(M, N \in \text{\(N^S\)-S} (W, P)\). Then the following results holds:
\[(i) \quad M \subseteq N \Rightarrow N^S_{\text{S}}(M) \subseteq N^S_{\text{S}}(N) \land N^S_{\text{cl}}(M) \subseteq N^S_{\text{cl}}(M);\]
\[(ii) \quad N^S_{\text{cl}}(M) \subseteq M \subseteq N^S_{\text{cl}}(M);\]
\[(iii) \quad N^S_{\text{int}}(0_{\text{\(N^S\)-S}}, P) = 0_{\text{\(N^S\)-S}}, N^S_{\text{cl}}(0_{\text{\(N^S\)-S}}, P) = 0_{\text{\(N^S\)-S}};\]
\[(iv) \quad N^S_{\text{int}}(1_{\text{\(N^S\)-S}}, P) = 1_{\text{\(N^S\)-S}}, N^S_{\text{cl}}(1_{\text{\(N^S\)-S}}, P) = 1_{\text{\(N^S\)-S}};\]
\[(v) \quad N^S_{\text{int}} N^S_{\text{cl}} (M) = M \land N^S_{\text{cl}} N^S_{\text{int}} (M) = M;\]
\[(vi) \quad N^S_{\text{int}} (M \cap N) = N^S_{\text{int}} (M) \cap N^S_{\text{int}} (M);\]
\[(vii) \quad N^S_{\text{cl}} (M \cup N) \supseteq N^S_{\text{cl}} (M) \cup N^S_{\text{cl}} (M).\]
(viii) \(N^S(M \cap N) = N^S(M) \cap N^S(N)\);
(ix) \(N^S(M \cap N) \subseteq N^S(M) \cap N^S(N)\).

Proof. For proof see (Bera & Mahapatra, 2017).

**Proposition 2.2.** Assume that \((X, E, \tau)\) be an \(N^S\)-TS over \((X, E)\) and \(M \in \text{NSS}(X, E)\). Then the following results hold:

(i) \((N^S\text{int}(M))^c = \text{cl}
(N^S(M))^c\);
(ii) \((N^S(M))^c = N^S\text{int}(M)^c\).

Proof. For proof see (Bera & Mahapatra, 2017)

**Definition 2.10.** Assume that \((W, P, \tau)\) be an \(N^S\)-TS over \((W, P)\). Then a family \([(Q_\alpha, P); \alpha \in \Delta]\) of \(N^S\)-O sets in \((W, P, \tau)\) is called an \(N^S\)-O cover (Bera & Mahapatra, 2018) of an \(N^S\)-S \((Q, P)\) if \((Q, P) \subseteq \bigcup_{\alpha \in \Delta} (Q_\alpha, P)\).

**Definition 2.11.** An \((W, P, \tau)\) over \((W, P)\) is said to be an \(N^S\)-compact set (Bera, & Mahapatra, 2018) if every \(N^S\)-O cover of \(W\) has a finite subcover.

### 3. Neutrosophic Simply Soft Open Set

**Definition 3.1.** Assume that \((W, P, \tau)\) be an \(N^S\)-TS over \((W, P)\). Then \((Q, P)\), a neutrosophic soft subset of \((W, P, \tau)\) is said to be a neutrosophic simply soft open \((\text{NSSO})\) set if \(N^S\text{int}(Q, P) \subseteq N^S\text{cl}(Q, P)\).

**Definition 3.2.** Assume that \((W, P, \tau)\) be an \(N^S\)-TS over \((W, P)\). Then \((Q, P)\), a neutrosophic soft subset of \((W, P, \tau)\) is said to be a neutrosophic simply soft closed \((\text{NSSC})\) set if its complement is an \(N^S\)-O set in \((W, P, \tau)\).

**Theorem 3.3.** In an \(N^S\)-TS \((W, P, \tau)\), every \(N^S\)-O set is an \(N^S\)-O set.

**Proof.** Assume that \((Q, P)\) be an \(N^S\)-O set in an \(N^S\)-TS \((W, P, \tau)\). Therefore \(N^S\text{int}(Q, P) = (Q, P)\).

Now, \((Q, P) \subseteq N^S\text{cl}(Q, P)\). This implies \((Q, P) \subseteq N^S\text{cl}(Q, P)\).

Now \((Q, P) \subseteq N^S\text{cl}(Q, P)\)
\[\Rightarrow N^S\text{cl}(Q, P) \subseteq N^S\text{int}(Q, P)\]
\[= N^S\text{int}(Q, P) \quad \text{[since } N^S\text{cl}(Q, P) \text{ is an } N^S\text{-C set in } (W, P, \tau)\]
\[\Rightarrow N^S\text{cl}(Q, P) \subseteq N^S\text{int}(Q, P)\]

Again, \(N^S\text{int}(Q, P) \subseteq N^S\text{cl}(Q, P)\)

From (1) and (2), we obtain,
\[N^S\text{int}(Q, P) \subseteq N^S\text{int}(Q, P)\]

Hence \((Q, P)\) is an \(N^S\)-O set in \((W, P, \tau)\).

**Definition 3.3.** Assume that \((W, P, \tau)\) be an \(N^S\)-TS. Then the Neutrosophic Simply Soft interior \((\text{NSSint})\) and Neutrosophic Simply Soft closure \((\text{NSScl})\) of a neutrosophic soft subset \((Q, P)\) of \((W, P, \tau)\) is defined by
\[N^S\text{int}(M, P) = \cup \{(Q, P); (Q, P) \text{ is an } N^S\text{-O set in } W \text{ and } (Q, P) \subseteq (M, P)\}\]
\[N^S\text{cl}(M, P) = \cap \{(K, P); (K, P) \text{ is an } N^S\text{-C set in } W \text{ and } (M, P) \subseteq (K, P)\}\]

**Definition 3.4.** Assume that \((W, P, \tau)\) be an \(N^S\)-TS over \((W, P)\). Then a collection \([(Q_\alpha, P); \alpha \in \Delta]\) of \(N^S\)-O sets in \((W, P, \tau)\) is said to be an \(N^S\)-O cover of an \(N^S\)-S \((Q, P)\) if \((Q, P) \subseteq \bigcup_{\alpha \in \Delta} (Q_\alpha, P)\).
Definition 3.5. An $N^S$-TS $(W, P, \tau)$ over $(W, P)$ is said to be an $N^S$-cont space if every $N^S$-O cover of $W$ has a finite subcover.

Definition 3.6. A neutrosophic soft subset $(K, P)$ of $(W, P, \tau)$ is said to be an $N^S$-Compact set relative to $W$ if every $N^S$-O cover of $(K, P)$ has a finite subcover.

Definition 3.6. A function $\psi: (W, P, \tau) \rightarrow (G, P, \tau)$ is said to be an $N^S$-continuous function if for each $N^S$-set $(Z, P)$ in $G$, $\psi^{-1}(Z, P)$ is an $N^S$-O set in $W$.

Definition 3.7. A function $\psi: (W, P, \tau) \rightarrow (G, P, \tau)$ is said to be an $N^S$-O function if $\psi(K, P)$ is an $N^S$-O set in $G$ whenever $(K, P)$ is an $N^S$-O set in $W$.

Theorem 3.2. Every $N^S$-C subset of an $N^S$-cont space $(W, P, \tau)$ is an $N^S$-cont set relative to $W$.

Proof. Assume that $(W, P, \tau)$ be an $N^S$-cont space and $(K, P)$ be an $N^S$-C set in $(W, P, \tau)$. Therefore $(K, P)$ is an $N^S$-O set in $(W, P, \tau)$. Let $U=\{(U_i, P) : i \in \Delta \text{ and } (U_i, P) \in N^S-O(W)\}$ be an $N^S$-O cover of $(K, P)$. Then $\mathcal{H} = \{(K, P) \cup U\}$ is an $N^S$-O cover of $W$. Since $W$ is an $N^S$-cont space, then it has a finite subcover say $\{(H_1, P), (H_2, P), (H_3, P), \ldots, (H_n, P), (K, P)\}$. Then $\{(H_1, P), (H_2, P), (H_3, P), \ldots, (H_n, P)\}$ is a neutrosophic finite simply soft open cover of $(K, P)$. Hence $(K, P)$ is an $N^S$-cont set relative to $W$.

Theorem 3.3. Every $N^S$-cont space is a neutrosophic soft compact space.

Proof. Assume that $(W, P, \tau)$ is an $N^S$-cont space. Suppose that $(W, P, \tau)$ is not an $N^S$-cont space. Therefore, there exists an $N^S$-O cover $\mathcal{R}$ (say) of $W$, which has no finite subcover. Since every $N^S$-O set is an $N^S$-O set, so we have an $N^S$-O cover $\mathcal{R}$ of $W$, which has no finite subcover. This contradicts our assumption. Hence $(W, P, \tau)$ must be an $N^S$-cont space.

Theorem 3.4. If $\psi: (W, P, \tau) \rightarrow (G, P, \tau)$ is an $N^S$-O function and $(G, P, \tau)$ is an $N^S$-cont space then $(W, P, \tau)$ is also an $N^S$-cont space.

Proof. Assume that $\psi: (W, P, \tau) \rightarrow (G, P, \tau)$ be an $N^S$-O function and $(G, P, \tau)$ be an $N^S$-cont space. Let $\mathcal{H} = \{(K_i, P) : i \in \Delta \text{ and } (K_i, P) \in N^S-O(W)\}$ be an $N^S$-O cover of $W$. This implies that $\psi(\mathcal{H}) = \{(\psi(K_i), P) : i \in \Delta \text{ and } \psi(K_i) \in N^S-O(G)\}$ is an $N^S$-O cover of $G$. Since $(G, P, \tau)$ is an $N^S$-cont space, so there exists a finite subcover say $\{(\psi(K_1), P), (\psi(K_2), P), \ldots, (\psi(K_n), P)\}$ such that $M \subseteq \cup \{(\psi(K_i), P) : i = 1, 2, \ldots, n\}$. This implies that $\{(K_1, p), (K_2, p), \ldots, (K_n, p)\}$ is a finite subcover for $W$. Therefore $(W, P, \tau)$ is an $N^S$-cont space.

Theorem 3.5. If $\psi: (W, P, \tau) \rightarrow (G, P, \tau)$ is an $N^S$-continuous function then for each $N^S$-O set $(Q, P)$ relative to $W$, $\psi(Q, P)$ is an $N^S$-cont set in $(G, P, \tau)$.

Proof. Assume that $\psi: (W, P, \tau) \rightarrow (G, P, \tau)$ is an $N^S$-continuous function and $(Q, P)$ is an $N^S$-O set relative to $W$. Let $\mathcal{H} = \{(H_i, P) : i \in \Delta \text{ and } (H_i, P) \in N^S-O(G)\}$ be an $N^S$-O cover of $\psi(Q, P)$. Therefore, by hypothesis $\psi^{-1}(\mathcal{H}) = \{\psi^{-1}(H_i, P) : i \in \Delta \text{ and } \psi^{-1}(H_i, P) \in N^S-O(W)\}$ is an $N^S$-O cover of $\psi(Q, P) = (Q, P)$. Since every $N^S$-O set is an $N^S$-O set, so $\psi^{-1}(\mathcal{H}) = \{\psi^{-1}(H_i, P) : i \in \Delta \text{ and } \psi^{-1}(H_i, P) \in N^S-O(W)\}$ is an $N^S$-O cover of $(Q, P)$. Since $(Q, P)$ is an $N^S$-O set relative to $W$. Therefore, $\psi(Q, P)$ is an $N^S$-O set in $(G, P, \tau)$.
W, so there exists a finite subcover of \((Q, P)\) say \(\{\psi_i^{-1}(H_1, P), \psi_i^{-1}(H_2, P), \ldots, \psi_i^{-1}(H_n, P)\}\) such that \((Q, P)\subseteq \bigcup_{i=1}^{n} \psi_i^{-1}(H_i, P)\). Now \((Q, P)\subseteq \bigcup_{i=1}^{n} \psi_i^{-1}(H_i, P)\).

\[
\Rightarrow \psi(Q, P) \subseteq \bigcup_{i=1}^{n} \psi_i^{-1}(H_i, P)\]  

Therefore there exist a finite subcover \(\{(H_1, P), (H_2, P), \ldots, (H_n, P)\}\) of \(\psi(Q, P)\) such that \((Q, P)\subseteq \bigcup_{i=1}^{n} (H_i, P)\). Hence \(\psi(Q, P)\) is an \(\mathbb{N}^S\)-compact set relative to \(G\).

**Theorem 3.6.** Every neutrosophic soft continuous function from an \(\mathbb{N}^S\)-TS \((W, P, \tau)\) to another \(\mathbb{N}^S\)-TS \((G, P, \tau)\) is an \(\mathbb{N}^S\)-continuous function.

**Proof.** Assume that \(\psi: (W, P, \tau) \rightarrow (G, P, \tau)\) be a neutrosophic soft continuous function. Let \((Q, P)\) be an \(\mathbb{N}^S\)-O set in \((G, P, \tau)\). Since \(\psi\) is a neutrosophic soft continuous function, \(\psi^{-1}(Q, P)\) is an \(\mathbb{N}^S\)-O set in \((W, P, \tau)\). Since every \(\mathbb{N}^S\)-O set is an \(\mathbb{N}^S\)-O set, \(\psi^{-1}(Q, P)\) is an \(\mathbb{N}^S\)-O set in \((G, P, \tau)\). Therefore \(\psi^{-1}(Q, P)\) is an \(\mathbb{N}^S\)-O set in \((G, P, \tau)\), whenever \((Q, P)\) is an \(\mathbb{N}^S\)-O set in \((W, P, \tau)\). Hence \(\psi((W, P, \tau) \rightarrow (G, P, \tau)\) is a \(\mathbb{N}^S\)-continuous function.

**Theorem 3.8.** If \(\psi: (W, P, \tau) \rightarrow (G, P, \tau)\) is an \(\mathbb{N}^S\)-continuous function and \(\gamma: (G, P, \tau) \rightarrow (H, P, \tau)\) be a neutrosophic soft continuous function, then the composition mapping \(\gamma \circ \psi: (W, P, \tau) \rightarrow (H, P, \tau)\) is an \(\mathbb{N}^S\)-continuous function.

**Proof.** Assume that \((Q, P)\) is an \(\mathbb{N}^S\)-O set in \((H, P, \tau)\). Since \(\gamma: (G, P, \tau) \rightarrow (H, P, \tau)\) is a neutrosophic soft continuous function, \(\gamma^{-1}(Q, P)\) is an \(\mathbb{N}^S\)-O set in \((G, P, \tau)\). Again since \(\psi: (W, P, \tau) \rightarrow (G, P, \tau)\) is an \(\mathbb{N}^S\)-continuous function, \(\psi^{-1}(\gamma^{-1}(Q, P)) = (\gamma \circ \psi)^{-1}(Q, P)\) is an \(\mathbb{N}^S\)-O set in \((W, P, \tau)\). Hence \((\gamma \circ \psi)^{-1}(Q, P)\) is an \(\mathbb{N}^S\)-O set in \((W, P, \tau)\), whenever \((Q, P)\) is an \(\mathbb{N}^S\)-O set in \((H, P, \tau)\). Therefore \((\gamma \circ \psi)^{-1}(Q, P)\) is an \(\mathbb{N}^S\)-continuous mapping.

**4. Conclusions**

In this article, we have introduced the \(\mathbb{N}^S\)-cover, \(\mathbb{N}^S\)-compact set, in an \(\mathbb{N}^S\)-TS. By defining \(\mathbb{N}^S\)-cover, \(\mathbb{N}^S\)-compact set, we have proved some propositions, theorems on \(\mathbb{N}^S\)-TS. In the future, we hope that based on these notions of neutrosophic simply soft compactness, many new investigations can be carried out. The proposed concepts can be explored in various neutrosophic hybrid sets such as rough neutrosophic set (Broumi, Smarandache, & Dhar, 2014), bipolar neutrosophic set (Deli, Ali, & Smarandache, 2015), etc.

**References:**


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