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Soft supra strongly semi* generalized closed sets

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Abstract. In this paper, we introduce the concept of soft supra strongly semi* generalized closed sets (soft supra strongly semi* g-closed for short) in a supra soft topological space (X, μ, E) and study their properties in detail. The relationship between soft supra strongly semi* generalized closed sets and other existing soft sets have been investigated. It has been pointed out in this paper that many of these parameters studied have, in fact, applications in real world situations and therefore I believe that this is an extra justification for the work conducted in this paper.

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1. Introduction

In 1970, Levine [13] introduced the notion of g-closed sets in topological spaces as a generalization of closed sets. Indeed ideals are very important tools in general topology. In 1983, Mashhour et al. [14] introduced the supra topological spaces, not only, as a generalization to the class of topological spaces, but also, these spaces were easier in the application as shown in [4]. In 2001, Popa et al. [16] generalized the supra topological spaces to the minimal spaces and generalized spaces as a new wider classes. In 2001, El-Sheikh [8] succeed to use the fuzzy supra topology to study some topological properties to the fuzzy bitopological spaces. In 2007, Arpad Szaz [5] succeed to introduce an application on the minimal spaces and generalized spaces. In 1987, Abd El-Monsef et al. [3] introduced the fuzzy supra topological spaces.

The notions of supra soft topological spaces were first introduced by El-Sheikh et al. [7]. Recently, Kandil et al. [12] introduced the concept of soft supra g-closed soft sets in supra soft topological spaces, which is generalized in [1]. Here, we used the concept of supra soft closure, supra soft interior and supra semi open soft sets to define the notion of soft supra strongly semi* generalized closed (resp. open) sets. The relationship between soft supra strongly semi* generalized closed sets and other existing soft sets have been investigated. Furthermore, the union and intersection of two soft supra strongly semi* generalized closed (resp. open) sets have been obtained.

2. Preliminaries

In this section, we present the basic definitions and results of soft set theory, which may be found in earlier studies. Throughout this paper, X will be a nonempty initial universe set and E will be the set of all parameters, which are often attributes, characteristics or properties of the objects in X. Let $P(X)$ be the power set of X. Then, the soft set over X is defined as follows:

Definition 2.1 ([15])**.** Let A be a non-empty subset of E. A pair (F, A) denoted by F_A is called a soft set over X , where $F : A \to P(X)$.

In other words, a soft set over X is a parameterized family of subsets of the universe X. For a particular $e \in A$, $F(e)$ may be considered the set of e-approximate elements of the soft set (F, A) and if $e \notin A$, then $F(e) = \varphi$, i.e.,

$$F_A = \{(e, F(e)) : e \in A \subseteq E,\ F : A \to P(X)\}.$$

The family of all these soft sets denoted by $SS(X)_A$. Clearly, a soft set is not a crisp set.

Definition 2.2 ([17])**.** Let τ be a collection of soft sets over a universe X with a fixed set of parameters E, then $\tau \subseteq SS(X)_E$ is called a soft topology on X, if

(i) $\tilde{X}, \tilde{\varphi} \in \tau$, where $\tilde{\varphi}(e) = \varphi$ and $\tilde{X}(e) = X$, $\forall e \in E$,

(ii) the union of any number of soft sets in τ belongs to τ,

(iii) the intersection of any two soft sets in τ belongs to τ.

The triplet (X, τ, E) is called a soft topological space over X. The members of τ are said to be open soft sets in X. We denote the set of all open soft sets over X by $OS(X, \tau, E)$, or $OS(X)$ and the set of all closed soft sets by $CS(X, \tau, E)$, or $CS(X)$.

Definition 2.3 ([9, 10])**.** Let (X, τ, E) be a soft topological space and $(F, E) \in SS(X)_E$. Then, (F, E) is said to be a semi open soft set, if $(F, E)\tilde{\subseteq} cl(int(F, E))$. The set of all semi open soft sets is denoted by $SOS(X)$ and the set of all semi closed soft sets is denoted by $SCS(X)$.

Definition 2.4 ([7])**.** Let τ be a collection of soft sets over a universe X with a fixed set of parameters E. Then $\mu \subseteq SS(X)_E$ is called supra soft topology on X with a fixed set E, if

(i) $\tilde{X}, \tilde{\varphi} \in \mu$,

(ii) the union of any number of soft sets in μ belongs to μ.

The triplet (X, μ, E) is called supra soft topological space (or supra soft spaces) over X.

Definition 2.5 ([7])**.** Let (X, μ, E) be a supra soft topological space and $(F, E) \in SS(X)_E$. Then, (F, E) is said to be a supra semi open soft set, if $(F, E)\tilde{\subseteq} cl^s(int^s(F, E))$. The set of all supra semi open soft sets is denoted by supra-$SOS(X)$ and the set of all semi closed soft sets is denoted by supra-$SCS(X)$.

Definition 2.6 ([12]). A soft set (F, E) is called soft supra generalized closed set (soft supra g-closed) in a supra soft topological space (X, μ, E) if $cl^s(F, E)\tilde{\subseteq}(G, E)$ whenever $(F, E)\tilde{\subseteq}(G, E)$ and (G, E) is supra open soft in X.

Definition 2.7 ([18]). A soft set (F, E) is called supra regular open [resp. closed] soft set in a supra soft topological space (X, μ, E), if $int^s(cl^s(F, E)) = (F, E)$ [resp. $cl^s(int^s(F, E)) = (F, E)$]. The set of all supra regular open soft sets is denoted by supra-$ROS(X)$ and the set of all supra regular closed soft sets is denoted by supra-$RCS(X)$. Also, it is called soft supra regular generalized closed (soft supra rg-closed) in a supra soft topological space (X, μ, E) if $cl^s(F, E)\tilde{\subseteq}(G, E)$, whenever $(F, E)\tilde{\subseteq}(G, E)$ and (G, E) is supra regular open soft in X.

Definition 2.8 ([2]). A soft set (F, E) is called a supra semi* generalized closed soft set (supra semi*g-closed soft) in a supra soft topological space (X, μ, E), if $cl^s(F, E)\tilde{\subseteq}(G, E)$ whenever $(F, E)\tilde{\subseteq}(G, E)$ and (G, E) is supra semi open soft in X.

3. Soft supra strongly semi* generalized closed sets

The notions of soft supra generalized closed sets in a supra soft topological space (X, μ, E) [7], were first introduced by Kandil et al. [12], which are generalized in [1]. In this section, we introduce and study the concept of soft strongly semi* generalized closed sets in supra soft topological spaces.

Definition 3.1. A soft set (F, E) is called soft supra strongly semi* generalized closed set (soft supra strongly semi* g-closed) in a supra soft topological space (X, μ, E), if $cl^s(int^s(F, E))\tilde{\subseteq}(G, E)$, whenever $(F, E)\tilde{\subseteq}(G, E)$ and (G, E) is supra semi open soft in X.

Example 3.1. Suppose that there are three phones in the universe X given by $X = \{p_1, p_2, p_3\}$. Let $E = \{e_1, e_2\}$ be the set of decision parameters which are stands for "expensive" and "android" respectively.
Let $(G_1, E), (G_2, E)$ be two soft sets over the common universe X, which describe the composition of the phones, which Mr. Z are going to buy, where:

$G_1(e_1) = \{p_2, p_3\}, \quad G_1(e_2) = \{p_1, p_2\},$
$G_2(e_1) = \{p_1, p_2\}, \quad G_2(e_2) = \{p_1, p_3\}.$

Then, $\mu = \{\tilde{X}, \tilde{\varphi}, (G_1, E), (G_2, E)\}$ is a supra soft topology over X. Thus, the soft sets $(F_1, E), (F_2, E)$, where:

$F_1(e_1) = \{p_2, p_3\}, \quad F_1(e_2) = \{p_1, p_3\},$
$F_2(e_1) = \{p_1, p_2\}, \quad F_2(e_2) = \{p_1, p_2\}.$

are soft supra strongly semi* g-closed in (X, μ, E), but the soft sets $(G_1, E), (G_2, E)$ are not soft supra strongly semi* g-closed.

Remark 3.1. The soft intersection (resp. soft union) of any two soft supra strongly semi* g-closed sets needs not to be a soft supra strongly semi* g-closed in general as shown in the following examples.

Example 3.2. Suppose that there are four alternatives in the universe of cars $X = \{a, b, c, d\}$ and consider $E = \{e_1, e_2\}$ be the set of decision parameters which are stands for "quality of cars" and "expensive" respectively.
Let $(F_1, E), (F_2, E), (F_3, E), (F_4, E), (F_5, E), (F_6, E), (F_7, E), (F_8, E), (F_9, E), (F_{10}, E),$

$(F_{11}, E), (F_{12}, E)$ be twelve soft sets over the common universe X, which describe the goodness of the cars which Mr. A are going to buy, where:

$F_1(e_1) = \{a\}$, $F_1(e_2) = \{d\}$,
$F_2(e_1) = \{a, d\}$, $F_2(e_2) = \{a, d\}$,
$F_3(e_1) = \{d\}$, $F_3(e_2) = \{a\}$,
$F_4(e_1) = \{a, b\}$, $F_4(e_2) = \{b, d\}$,
$F_5(e_1) = \{b, d\}$, $F_5(e_2) = \{a, b\}$,
$F_6(e_1) = \{a, b, c\}$, $F_6(e_2) = \{a, b, c\}$,
$F_7(e_1) = \{b, c, d\}$, $F_7(e_2) = \{b, c, d\}$,
$F_8(e_1) = \{a, b, d\}$, $F_8(e_2) = \{a, b, d\}$,
$F_9(e_1) = X$, $F_9(e_2) = \{a, b, c\}$,
$F_{10}(e_1) = \{b, c, d\}$, $F_{10}(e_2) = X$,
$F_{11}(e_1) = \{a, b, c\}$, $F_{11}(e_2) = X$,
$F_{12}(e_1) = X$, $F_{12}(e_2) = \{b, c, d\}$.

Then, $\mu = \{\tilde{X}, \tilde{\varphi}, (F_1, E), (F_2, E), (F_3, E), (F_4, E), (F_5, E), (F_6, E), (F_7, E), (F_8, E), (F_9, E), (F_{10}, E), (F_{11}, E), (F_{12}, E)\}$ is a supra soft topology over X. Thus, the soft sets $(H_1, E), (H_2, E)$ are soft supra strongly semi* g-closed in (X, μ, E), where:

$H_1(e_1) = \{a, b, c\}$, $H_1(e_2) = \{b, c, d\}$,
$H_2(e_1) = \{a, b, d\}$, $H_2(e_2) = \{b, c, d\}$.

But, their soft intersection $(H_1, E)\tilde{\cap}(H_2, E) = (Q, E)$, where:

$Q(e_1) = \{a, b\}$, $Q(e_2) = \{b, c, d\}$,

is not soft supra strongly semi* g-closed.

On the other hand, the soft sets $(G_1, E), (G_2, E)$ are soft supra strongly semi* g-closed sets in (X, μ, E), where:

$G_1(e_1) = \{d\}$, $G_1(e_2) = \{d\}$,
$G_2(e_1) = \{a\}$, $G_2(e_2) = \{a\}$.

But, their soft union $(G_1, E)\tilde{\cup}(G_2, E) = (P, E)$, where:

$P(e_1) = \{a, d\}$, $P(e_2) = \{a, d\}$,

is not soft supra strongly semi* g-closed.

Theorem 3.1. *Every supra closed soft set is a soft supra strongly semi* g-closed in a supra soft topological space.*

Proof. Let $F_E \tilde{\subseteq} G_E$ and $G_E \in$ supra-$SOS(X)$. Since F_E is closed soft,

$$cl^s(int^s(F_E)) \tilde{\subseteq} cl^s(F_E) = F_E \tilde{\subseteq} G_E.$$

Then, F_E is soft supra strongly semi* g-closed. □

Remark 3.2. The converse of the above theorem is not true in general as shall shown in the following example.

Example 3.3. In Example 3.1, the soft sets $(F_1, E), (F_2, E)$ are soft supra strongly semi* g-closed in (X, μ, E), but not supra closed soft.

Theorem 3.2. *If a soft subset F_E of a supra soft topological space (X, μ, E) is both supra semi open soft and soft supra strongly semi* g-closed, then it is supra regular closed soft set.*

Proof. Since F_E is supra semi open soft and soft supra strongly semi* g-closed,

$$cl^s(int^s(F_E)) \tilde{\subseteq} F_E \tilde{\subseteq} cl^s(int^s(F_E)).$$

Then, F_E is supra regular closed soft set. □

Theorem 3.3. *In a supra soft topological space (X, μ, E), supra-$SOS(X)$ = supra-$RCS(X)$ if and only if each soft set is soft supra strongly semi* g-closed.*

Proof. Necessity: Let F_E be any soft subset of $\tilde{X}$ such that $F_E \tilde{\subseteq} G_E$, where $G_E \in$ supra-$SOS(X)$. Then, by hypothesis, $G_E \in$ supra-$RCS(X)$. Thus, $cl^s(int^s(F_E)) \tilde{\subseteq} cl^s(int^s(G_E)) = G_E$. So, F_E is soft supra strongly semi* g-closed.

Sufficient: Let $O_E \in$ supra-$SOS(X)$. From the necessary condition, O_E is soft supra strongly semi* g-closed. Then, $cl^s(int^s(O_E)) \tilde{\subseteq} O_E \tilde{\subseteq} cl^s(int^s(O_E))$. This implies that, $O_E \in$ supra-$RCS(X)$. Thus, supra-$SOS(X) \subseteq$ supra-$RCS(X)$. But, we have supra-$RCS(X) \subseteq$ supra-$SOS(X)$. This means that, supra-$SOS(X)$ = supra-$RCS(X)$. □

Theorem 3.4. *Let (X, μ, E) be a supra soft topological space and F_E be a soft supra strongly semi* g-closed in X. If $F_E \tilde{\subseteq} H_E \tilde{\subseteq} cl^s(int^s(F_E))$, then H_E is soft supra strongly semi* g-closed.*

Proof. Let $H_E \tilde{\subseteq} G_E$ and $G_E \in$ supra-$SOS(X)$. Since $F_E \tilde{\subseteq} H_E \tilde{\subseteq} G_E$ and F_E is soft supra strongly semi* g-closed in X, $cl^s(int^s(F_E)) \tilde{\subseteq} G_E$. Thus,

$$cl^s(int^s(H_E)) = cl^s(int^s(F_E)) \tilde{\subseteq} G_E.$$

So, H_E is soft supra strongly semi* g-closed. □

Theorem 3.5. *A soft subset H_E of a supra soft topological space (X, μ, E) is soft supra strongly semi* g-closed if and only if $cl^s(int^s(H_E)) \setminus H_E$ contains only null supra semi closed soft set.*

Proof. Necessity: Let H_E be a soft supra strongly semi* g-closed set, let F_E be a non-null supra semi closed soft and $F_E \tilde{\subseteq} cl^s(int^s(H_E)) \setminus H_E$. Then, $F_E \tilde{\subseteq} H_E^{\tilde{c}}$ implies that $H_E \tilde{\subseteq} F_E^{\tilde{c}}$. Since H_E is soft supra strongly semi* g-closed and $F_E^{\tilde{c}}$ is supra semi open soft, $cl^s(int^s(H_E)) \tilde{\subseteq} F_E^{\tilde{c}}$. Thus, $F_E \tilde{\subseteq} [cl^s(int^s(H_E))]^{\tilde{c}}$. So,

$$F_E \tilde{\subseteq} cl^s(int^s(H_E)) \tilde{\cap} [cl^s(int^s(H_E))]^{\tilde{c}} = \tilde{\varphi}.$$

Hence, $F_E = \tilde{\varphi}$, which is a contradiction. Therefore, $cl^s(int^s(H_E)) \setminus H_E$ contains only null supra semi closed soft set.

Sufficient: Assume that $cl^s(int^s(H_E)) \setminus H_E$ contains only null supra semi closed soft set, $H_E \tilde{\subseteq} G_E$, where G_E is supra semi open soft set. Suppose $cl^s(int^s(H_E)) \tilde{\nsubseteq} G_E$. Then, $cl^s(int^s(H_E)) \tilde{\cap} G_E^{\tilde{c}}$ is a non-null supra semi closed soft subset of $cl^s(int^s(H_E)) \setminus H_E$. This is a contradiction. Thus, H_E is a soft supra strongly semi* g-closed. □

Corollary 3.1. *A soft supra strongly semi* g-closed H_E is supra regular closed soft if and only if $cl^s(int^s(H_E)) \setminus H_E$ is supra semi closed soft and $H_E \tilde{\subseteq} cl^s(int^s(H_E))$.*

Proof. Necessity: Sine H_E is supra regular closed soft, $H_E = cl^s(int^s(H_E))$. Then, $cl^s(int^s(H_E)) \setminus H_E = \tilde{\varphi}$ is supra semi closed soft.

Sufficient: Assume that $cl^s(int^s(H_E)) \setminus H_E$ is supra semi closed soft. Since H_E is soft supra strongly semi* g-closed, $cl^s(int^s(H_E)) \setminus H_E$ contains only null supra semi closed soft set from Theorem 3.5. Since $cl^s(int^s(H_E)) \setminus H_E$ is supra semi closed soft, it follows that, $cl^s(int^s(H_E)) \setminus H_E = \tilde{\varphi}$, implies that $cl^s(int^s(H_E)) \tilde{\subseteq} H_E$. But,

$H_E \tilde{\subseteq} cl^s(int^s(H_E))$ from the necessary condition. Thus, $H_E = cl^s(int^s(H_E))$ and H_E is supra regular closed soft. □

4. Soft supra strongly semi* generalized open sets

Definition 4.1. A soft set F_E is called soft supra strongly semi* g-open set (soft supra strongly semi* g-open) in a supra soft topological space (X, μ, E), if its relative complement $F_E^{\tilde{c}}$ is soft supra strongly semi* g-closed.

Example 4.1. In Example 3.1, the soft sets $(F_1, E)^{\tilde{c}}, (F_2, E)^{\tilde{c}}$ are soft supra strongly semi* g-open, where $(F_1, E)^{\tilde{c}} and (F_2, E)^{\tilde{c}}$ are defined by:

$F_1^{\tilde{c}}(e_1) = \{p_1\}, \quad F_1^{\tilde{c}}(e_2) = \{p_2\},$
$F_2^{\tilde{c}}(e_1) = \{p_3\}, \quad F_2^{\tilde{c}}(e_2) = \{p_3\}.$

Theorem 4.1. *A soft set G_E is soft supra strongly semi* g-open set if and only if $F_E \tilde{\subseteq} int^s(cl^s(G_E))$ whenever $F_E \tilde{\subseteq} G_E$ and F_E is supra semi closed soft.*

Proof. Necessity: Let $F_E \tilde{\subseteq} G_E$ and F_E be supra semi closed soft in X. Then $G_E^{\tilde{c}} \tilde{\subseteq} F_E^{\tilde{c}}$ and $F_E^{\tilde{c}}$ is supra semi open soft. Since $G_E^{\tilde{c}}$ is soft supra strongly semi* g-closed, $cl^s(int^s(G_E^{\tilde{c}})) \tilde{\subseteq} F_E^{\tilde{c}}$. Thus,

$$F_E \tilde{\subseteq} [cl^s(int^s(G_E^{\tilde{c}}))]^{\tilde{c}} = int^s(cl^s(G_E)).$$

Sufficient: Let $G_E^{\tilde{c}} \tilde{\subseteq} H_E$ and H_E be supra semi open soft in X. Then, $H_E^{\tilde{c}} \tilde{\subseteq} G_E$ and $H_E^{\tilde{c}}$ is supra semi closed soft in X. Thus, $H_E^{\tilde{c}} \tilde{\subseteq} int^s(cl^s(G_E))$, from the necessary condition. So, $[int^s(cl^s(G_E))]^{\tilde{c}} = cl^s(int^s(G_E^{\tilde{c}})) \tilde{\subseteq} H_E$ and H_E is supra semi open soft in X. This shows that, $G_E^{\tilde{c}}$ is soft supra strongly semi* g-closed in X. Hence, G_E is soft supra strongly semi* g-open set. □

Remark 4.1. The soft intersection (resp. soft union) of any two soft supra strongly semi* g-open sets is not soft supra strongly semi* g-open in general as shown in the following examples.

Examples 4.1. (1) In Example 3.2, the soft sets $(L_1, E), (L_2, E)$ are soft supra strongly semi* g-open sets in (X, μ, E), where:

$L_1(e_1) = \{a, b, c\}$, $L_1(e_2) = \{a, b, c\}$,
$L_2(e_1) = \{b, c, d\}$, $L_2(e_2) = \{b, c, d\}$.

But, their soft intersection $(L_1, E) \tilde{\cap} (L_2, E) = (J, E)$, where:

$J(e_1) = \{b, c\}$, $J(e_2) = \{b, c\}$,

is not soft supra strongly semi* g-open.

(2) Suppose that there are two jobs in the universe X given by $X = \{j_1, j_2\}$. Let $E = \{e_1, e_2\}$ be the set of decision parameters which are stands for "salary" and "position", respectively.

Let $(G_1, E), (G_2, E), (G_3, E), (G_4, E)$ be four soft sets over the common universe X, which describe the details of the jobs which Mr. S are going to work, where:

$G_1(e_1) = X, \quad G_1(e_2) = \{j_2\},$
$G_2(e_1) = \{j_1\}, \quad G_2(e_2) = X,$
$G_3(e_1) = \{j_1\}, \quad G_3(e_2) = \{j_2\},$
$G_4(e_1) = \{j_2\}, \quad G_4(e_2) = \{j_2\}.$

Then, $\mu = \{\tilde{X}, \tilde{\varphi}, (G_1, E), (G_2, E), (G_3, E), (G_4, E)\}$ is a supra soft topology over X.

Thus, the soft sets $(H_1, E), (H_2, E)$ are soft supra strongly semi* g-open in (X, μ, E), where:

$F(e_1) = X, \quad F(e_2) = \{j_1\},$
$H(e_1) = \{j_2\}, \quad H(e_2) = X.$

But, their soft intersection $(F, E)\tilde{\cap}(H, E) = (A, E)$ where:

$A(e_1) = \{j_2\}, \quad A(e_2) = \{j_1\},$

is not soft supra strongly semi* g-open.

Theorem 4.2. *Every supra open soft is a soft supra strongly semi* g-open.*

Proof. Let A_E be a supra open soft set such that $F_E\tilde{\subseteq}A_E$, where $F_E \in$ supra-$SCS(X)$. Then, $F_E\tilde{\subseteq}A_E = int^s(A_E)\tilde{\subseteq}int^s(cl^s(A_E))$. Thus, A_E is soft supra strongly semi* g-open. □

Remark 4.2. The converse of the above theorem is not true in general as shown in the following example.

Example 4.2. In Example 3.1, the soft sets $(F_1, E)^{\tilde{c}}, (F_2, E)^{\tilde{c}}$ are soft supra strongly semi* g-open in (X, μ, E), but not supra open soft over X, where:

$F_1^{\tilde{c}}(e_1) = \{p_1\}, \quad F_1^{\tilde{c}}(e_2) = \{p_2\},$
$F_2^{\tilde{c}}(e_1) = \{p_3\}, \quad F_2^{\tilde{c}}(e_2) = \{p_3\}.$

Theorem 4.3. *If a soft subset F_E of a supra soft topological space (X, μ, E) is both supra semi closed soft and soft supra strongly semi* g-open, then it is supra regular open soft.*

Proof. Since F_E is supra semi closed soft and soft supra strongly semi* g-open, then

$$int^s(cl^s(F_E))\tilde{\subseteq}F_E\tilde{\subseteq}int^s(cl^s(F_E)).$$

Thus, F_E is supra regular open soft. □

Theorem 4.4. *A soft subset H_E of a supra soft topological space (X, μ, E) is soft supra strongly semi* g-open if and only if $H_E \setminus int^s(cl^s(H_E))$ contains only null supra semi open soft set.*

Proof. It is similar to the proof of Theorem 3.5. □

Corollary 4.1. *A soft supra strongly semi* g-open H_E is supra regular open soft if and only if $H_E \setminus int^s(cl^s(H_E))$ is supra closed soft and $H_E\tilde{\subseteq}int^s(cl^s(H_E))$.*

Proof. It is similar to the proof of Corollary 3.1. □

Theorem 4.5. *Let (X, μ, E) be a supra soft topological space and F_E be a soft supra strongly semi* g-open in X. If $int^s(cl^s(F_E))\tilde{\subseteq}H_E\tilde{\subseteq}F_E$, then H_E is soft supra strongly semi* g-open.*

Proof. Let $G_E\tilde{\subseteq}H_E$ and $G_E \in$ supra-$SCS(X)$. Since $G_E\tilde{\subseteq}H_E\tilde{\subseteq}F_E$ and F_E is soft supra strongly semi* g-open in X, $G_E\tilde{\subseteq}int^s(cl^s(F_E))$. Then,

$$G_E\tilde{\subseteq}int^s(cl^s(F_E))\tilde{\subseteq}int^s(cl^s(H_E)).$$

Thus, H_E is soft supra strongly semi* g-open. □

5. Conclusion

In this paper, the notions of supra strongly semi* generalized closed sets and supra strongly semi* generalized open sets have been introduced and investigated. In future, the generalization of these concepts by using the notions of soft ideals [11] will be introduced and the future research will be undertaken in this direction.

6. Contribution

In Definition 3.1, if we exchange (G, E) to be a supra α- (resp. β-, b-) open soft set [6, 7] instead of supra semi open soft set, we can get a similar results to which have been obtained here.

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