Malaysian Journal of Mathematical Sciences 9(1): 77-89 (2015)

MALAYSIAN JOURNAL OF MATHEMATICAL SCIENCES

Journal homepage: http://einspem.upm.edu.my/journal

Soft Semi Star Generalized Closed Sets

*K. Kannan and D. Rajalakshmi

Department of Mathematics,
Srinivasa Ramanujan Centre, Sastra University,
Kumbakonam-612001, Tamil Nadu, India

E-mail: anbukkannan@rediffmail.com and drajilak@gmail.com

*Corresponding author

ABSTRACT

Soft sets have many applications in various real time problems in the field of engineering, social science, medical science etc. Recently, the concept of soft topological space has been developed with the help of soft sets. In the present paper, we introduce the concept of soft semi star generalized closed sets in soft topological spaces and soft S*GO-compactness. We further investigate some relationship among various soft generalized closed sets.

Keywords: Soft generalized closed sets, soft gs-closed sets, soft sg-closed sets, soft s*g-closed sets, soft S*GO-compact space.

1. INTRODUCTION

Molodtsov (1999) initiated the study of soft set theory as a new mathematical tool by overcoming the difficulties of theory of fuzzy sets (Zadeh (1965)), theory of intuitionistic fuzzy sets (Atanassov (1986)), theory of vague sets, theory of interval mathematics (Atanassov (1994); Gorzalzany (1987)) and theory of rough sets (Pawlak (1982)). According to him, a soft set over the universe U is a parametrized family of subsets of the universe U. In decision making problems, Maji et al. (2002);(2003) found an application of soft sets whereas Chen (2005) gave a new idea of soft set parametrization reduction and a comparison of it with attribute reduction in rough set theory. Further, soft sets are a class of special information (Pie and Miao(2005)).

Muhammad Shabir and Munazza Naz (2011) introduced soft topological spaces which are defined over an initial universe with a fixed set of parameters. The notions of soft open sets, soft closed sets, soft closure, soft interior points, soft neighborhood of a point and soft separation axioms are also introduced and their basic properties are investigated by them. Meanwhile, generalized closed sets in topological spaces were introduced (Levine (1970)) in 1970. However, it is extended to soft topological spaces in the year 2012 (Kannan (2012)).

Chandrasekhara Rao and Joseph (2000) introduced semi star generalized closed sets in topological spaces. In the present paper, we introduce the concept of soft semi star generalized closed sets in soft topological spaces and soft S*GO-compactness. We further investigate some relationship among various soft generalized closed sets.

2. PRELIMINARIES

Let U, E be an initial universe and a set of parameters, respectively. Let P(U), E_1 denote the power set of U and a non-empty subset of E, respectively. A pair (M, E_1) is called a soft set over U, where M: $E_1 \rightarrow P(U)$ is a mapping. For $\varepsilon \in E_1$, M(ε) may be considered as the set of ε-approximate elements of the soft set (M, E_1). For two soft sets (M, E_1) and (N, E_2) over a common universe U, we say that (M, E_1) is a soft subset of (N, E_2) if (1) $E_1 \subseteq E_2$ and (2) for all $e \in E_1$, M(e) and N(e) are identical approximations. We write (M, E_1) $\tilde{\subseteq}$ (N, E_2). (M, E_1) is said to be a soft superset of (N, E_2), if (N, E_2) is a soft subset of (M, E_1). We denote it by (M, E_1) $\tilde{\supseteq}$ (N, E_2). Two soft sets (M, E_1) and (N, E_2) over a common universe U are said to be soft equal if (M, E_1) is a soft subset of (N, E_2) and (N, E_2) is a soft subset of (M, E_1).

The union of two soft sets of (M, E_1) and (N, E_2) over the common universe U is the soft set (O, E_3), where $E_3 = E_1 \cup E_2$ and for all $e \in E_3$, O(e) = M(e) if $e \in E_1 - E_2$, N(e) if $e \in E_2 - E_1$ and M(e) $\cup$ N(e) if $e \in E_1 \cap E_2$. We write (M, E_1) $\tilde{\cup}$ (N, E_2) = (O, E_3). The intersection (O, E_3) of two soft sets (M, E_1) and (N, E_2) over a common universe U, denoted by (M, E_1) $\tilde{\cap}$ (N, E_2), is defined as $E_3 = E_1 \cap E_2$, and O(e) = M (e) $\cap$ N(e) for all $e \in E_3$. The relative complement of a soft set (M, E_1) is denoted by (M, E_1)' and is defined by (M, E_1)' = (M', E_1) where M': $E_1 \rightarrow P(U)$ is a mapping given by M'(e) = U – M(e) for all $e \in E_1$.

Let X be an initial universe set, E be the set of parameters. Let τ be the collection of soft sets over X, then is said to be a soft topology on X if (1) $\tilde{\phi}$, $\tilde{X}$ belong to τ, (2) the union of any number of soft sets in τ belongs to τ, (3) 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. Let (X, τ, E) be a soft space over X, then the members of τ are said to be soft open sets in X. A soft set (M, E) over X is said to be a soft closed set in X, if its relative complement (M, E)' belongs to τ.

Let X be an initial universe set, E be the set of parameters and $\tau = \{\tilde{\phi}, \tilde{X}\}$. Then τ is called the soft indiscrete topology on X and (X, τ, E) is said to be a soft indiscrete space over X. Let X be an initial universe set, E be the set of parameters and let τ be the collection of all soft sets which can be defined over X. Then τ is called the soft discrete topology on X and (X, τ, E) is said to be a soft discrete space over X.

Let (X, τ, E) be a soft topological space over X and (M, E) be a soft set over X. Then, the soft closure of (M, E), denoted by $\overline{(M, E)}$ is the intersection of all soft closed supersets of (M, E). Clearly $\overline{(M, E)}$ is the smallest soft closed set over X which contains (M, E). The soft interior of (M, E), denoted by $(M, E)^o$ is the union of all soft open subsets of (M, E).

Clearly $(M, E)^\circ$ is the largest soft open set over X which is contained in (M, E). A soft set (A, E) is soft semi open if (A, E) $\tilde{\subseteq}$ $\overline{(A, E)^0}$. A soft set (A, E) is called a soft generalized closed (soft g-closed) in a soft topological space (X, τ, E) if $\overline{(A, E)}$ $\tilde{\subseteq}$ (U, E) whenever (A,E) $\tilde{\subseteq}$ (U,E) and (U, E) is soft open in X.

3. SOFT S*G-CLOSED SETS

Definition 3.1 A set (A, E) is a soft s*g-closed set if $\overline{(A, E)}$ $\tilde{\subseteq}$(U, E) whenever (A, E) $\tilde{\subseteq}$(U, E) and (U, E) is soft semi-open in X.

Example 3.2 Let X = {a, b}, E = {e_1, e_2} and τ = {$\tilde{\phi}$, $\tilde{X}$, (A, E), (B, E), (C, E), (D, E)} be a soft topology defined on X, where (A, E), (B, E), (C, E), (D, E) are soft sets over X, defined as follows: A(e_1) = {a}, A(e_2) = ϕ, B(e_1) = {a}, B(e_2) = {a, b}, C(e_1) = {a}, C(e_2) = {a}, D(e_1) = {a}, D(e_2) = {b}. Then (F, E) is soft s*g-closed in (X, τ, E), where F(e_1) = {b}, F(e_2) = ϕ.

Theorem 3.3 If (A, E) is soft closed then (A, E) is soft s*g-closed .

Proof.
Let (A, E) be a soft closed set. Let (A, E) $\tilde{\subseteq}$ (U, E) and (U, E) is soft semi-open in X. Since A is soft closed, $\overline{(A, E)}$ = (A, E) $\tilde{\subseteq}$ (U, E). Therefore, (A, E) is soft s*g-closed.

Remark 3.4 The converse of the above theorem is not true in general. The following example supports our claim.

Example 3.5 Let X = {a, b}, E = {e_1, e_2} and τ = {$\tilde{\phi}$, $\tilde{X}$, (G, E), (H, E)} be a soft topology defined on X, where (G, E), (H, E) are soft sets over X, defined as follows: G(e_1) = {a}, G(e_2) = {a}, H(e_1) = {b}, H(e_2) = {b}. Then (I, E) is soft s*g-closed, but soft closed in (X, τ, E), where I(e_1) = ϕ, I(e_2) = {b}.

Theorem 3.6 If (A, E) is soft semi-open and soft s*g closed then it is soft closed.

Proof.
Let (A, E) be soft semi open and soft s*g-closed set in X. Now (A, E) $\tilde{\subseteq}$ (A, E) implies that $\overline{(A, E)}$ $\tilde{\subseteq}$ (A, E).Consequently, $\overline{(A, E)}$ = (A, E). Therefore, (A, E) is soft closed.

Theorem 3.7 If (A, E) is soft s*g-closed, then it is soft g-closed.

Proof.
Suppose that (A, E) $\tilde{\subseteq}$ (U, E) where (U, E) is soft open in X, This implies that (U, E) is soft semi open in X. Since (A, E) is soft s*g-closed $\overline{(A, E)}$ $\tilde{\subseteq}$ (U, E). Hence (A, E) is soft g-closed.

Theorem 3.8 If (A, E) is soft s*g-closed then it is soft sg-closed.

Proof.
Let (A, E) $\tilde{\subseteq}$ (U, E), where (U, E) is soft semi open in X. Since (A, E) is soft s*g-closed, $\overline{(A, E)}$ $\tilde{\subseteq}$ (U, E). Consequently s- $\overline{(A, E)}$ $\tilde{\subseteq}$ (U, E). Hence (A, E) is soft sg-closed.

Theorem 3.9 If (A, E) is soft s*g-closed then it is soft gs-closed.

Proof.
The proof is obvious

Remark 3.10 The converse of the theorems need not be true in general. The following example supports our claim.

Example 3.11 In Example 3.2, (J, E) is both soft g-closed and soft gs-closed, but soft s*g-closed in (X, τ, E), where $J(e_1) = \{a, b\}$, $J(e_2) = \{b\}$. Also, (K, E) is soft sg-closed, but soft s*g-closed in (X, τ, E), where $K(e_1) = \phi$, $K(e_2) = \{b\}$.

Remark 3.12 In a soft topological space with τ = SO(X, τ, E), the set of all soft g-closed sets of (X, τ, E) is written in short as soft GC(X, τ, E), the set of all soft sg-closed sets of (X, τ, E) is written in short as soft SGC(X, τ, E), the set of all soft gs-closed sets is written as soft GSC(X, τ, E) and the set of all soft s*g-closed sets are written as soft S*GC(X, τ, E) are equal to each other.

Theorem 3.13 If (A, E) is soft s*g-closed in X and (A, E) $\tilde{\subseteq}$ (B, E) $\tilde{\subseteq}$ $\overline{(A, E)}$, then (B, E) is soft s*g-closed.

Proof.
Let (B, E) $\tilde{\subseteq}$ (U, E), where (U, E) is soft semi open in X. Since (A, E) is soft s*g-closed and (A, E) $\tilde{\subseteq}$ (U, E), $\overline{(A, E)}$ $\tilde{\subseteq}$ (U, E). Then, (B, E) $\tilde{\subseteq}$ $\overline{(A, E)}$ implies that $\overline{(B, E)}$ $\tilde{\subseteq}$ (U, E) and so (B, E) is soft s*g-closed.

Theorem 3.14 If (A, E) and (B, E) are soft s*g-closed sets then so is (A, E) $\tilde{\cup}$ (B, E).

Proof.
Let $[(A, E)\ \tilde{\cup}\ (B, E)] \tilde{\subseteq} (U, E)$, where (U, E) is soft semi open in X. Then $(A, E) \tilde{\subseteq} (U, E)$ and $(B, E) \tilde{\subseteq} (U, E)$. Since (A, E) and (B, E) are soft s*g-closed, $\overline{(A, E)} \tilde{\subseteq} (U, E)$ and $\overline{(B, E)} \tilde{\subseteq} (U, E)$.

Therefore, $\overline{(A, E)}\ \tilde{\cup}\ \overline{(B, E)} \tilde{\subseteq} (U, E)$ and hence $\overline{(A, E)\tilde{\cup}(B, E)} \tilde{\subseteq} (U, E)$. So (A, E) $(A, E)\tilde{\cup}(B, E)$ is soft s*g-closed.

Remark 3.15 The intersection two soft s*g-closed sets need not be soft s*g-closed in general. The following example supports our claim.

Example 3.16
Let X = {a, b, c}, E = {e_1, e_2} and $\tau = \{\tilde{\phi}, \tilde{X}$, (L, E), (M, E), (N, E)} be a soft topology defined on X, where (L, E), (M, E), (N, E) are soft sets over X, defined as follows: L(e_1) = {b}, L(e_2) = {a}, M(e_1) = {b, c}, M(e_2) = {a, b}, N(e_1) = {a, b}, N(e_2) = {a, c}. Then (O, E), (P, E) are soft s*g-closed sets in (X, τ, E), where O(e_1) = {c}, O(e_2) = {b}, P(e_1) = {a}, P(e_2) = {a, b, c}. But $(O, E)\ \tilde{\cap}\ (P, E) = (Q, E)$ is not soft s*g-closed where Q(e_1) = ϕ, Q(e_2) = {b}.

Theorem 3.17 A soft set (A, E) is soft s*g-closed if and only if $\overline{(A, E)} - (A, E)$ contains no non empty soft semi closed set.

Proof.
Necessity: Let (F, E) be a soft semi closed set such that $(F, E) \tilde{\subseteq} \overline{(A, E)} - (A, E)$. Since (F,E)' is soft semi open and $(A, E) \tilde{\subseteq} (F, E)'$. From the definition of soft s*g-closed set, it follows that $\overline{(A, E)} \tilde{\subseteq} (F, E)'$. Consequently, $(F, E) \tilde{\subseteq} \left[\overline{(A, E)}\right]'$. This implies that $(F, E) \tilde{\subseteq} \overline{(A, E)}\ \tilde{\cap} \left[\overline{(A, E)}\right]' = \tilde{\phi}$.

Sufficient: Let $(A, E) \tilde{\subseteq} (O, E)$ and (O, E) be soft semi open in X. If $\overline{(A, E)}\ \tilde{\not\subseteq}$ (O, E), then $\overline{(A, E)}\ \tilde{\cap}\ (O, E)' \neq \tilde{\phi}$. Since $\overline{(A, E)}\ \tilde{\cap}\ (O, E)' \tilde{\subseteq} \overline{(A, E)}\ \tilde{\cap}\ (A, E)' = \overline{(A, E)} - (A, E)$ and $\overline{(A, E)}\ \tilde{\cap}\ (O, E)'$ is a non-empty soft semi closed set, we obtain a contradiction. This proves the sufficiency and hence the theorem.

Corollary 3.18 Let (A, E) be soft s*g-closed. Then (A, E) is soft closed if and only if $\overline{(A, E)} - (A, E)$ is soft semi closed.

Proof.
Necessity: Let (A, E) be soft s*g-closed which is also soft closed. Then, $\overline{(A, E)} - (A, E) = \tilde{\phi}$ which is soft semi closed.

Sufficiency: Let $\overline{(A, E)} - (A, E)$ be soft semi closed and (A, E) be soft s*g-closed. Then, $\overline{(A, E)} - (A, E)$ does not contain any non-empty soft semi closed subset. Since $\overline{(A, E)} - (A, E)$ is semi closed, $\overline{(A, E)} - (A, E) = \tilde{\phi}$ which implies that (A, E) is soft closed.

Theorem 3.19 In (X, τ, E), SO(X, τ, E) = τ = C(X, τ, E) if and only if every soft subset of X is soft s*g-closed.

Proof.
Necessity: Let (A, E) be such that (A, E) $\tilde{\subseteq}$ (O, E) where (O, E) is soft semi open in X. Then (O, E) ∈ C(X, τ, E) and therefore $\overline{(A, E)} \tilde{\subseteq} \overline{(O, E)}$ = (O, E), which shows that (A, E) is soft s*g-closed.

Sufficiency: Let (O, E)∈ τ. Since by hypothesis, every soft subset of X is soft s*g-closed, (O, E) is soft s*g-closed. This shows that $\overline{(O, E)} \tilde{\subseteq}$ (O, E). Then, $\overline{(O, E)}$ =(O, E) implies that (O, E)∈ C(X, τ, E). Therefore, τ $\tilde{\subseteq}$ C(X, τ, E). Next let (F, E)∈ C(X, τ, E), then (F, E)' ∈ τ. By the above argument, (F, E)'∈ C(X, τ, E), hence (F, E) ∈ τ.

This shows that C(X, τ, E) $\tilde{\subseteq}$ τ. Consequently, C(X, τ, E) = τ. Now let (U, E) ∈ SO(X,τ, E). Since (U, E) is soft s*g-closed, $\overline{(U, E)} \tilde{\subseteq}$ (U, E). Consequently, (U, E) ∈ C(X, τ, E) which implies that SO(X, τ, E) $\tilde{\subseteq}$ C(X, τ, E) = τ. But always τ $\tilde{\subseteq}$ SO(X, τ, E). Therefore, τ = SO(X, τ, E). This proves the theorem.

Corollary 3.20 If (A, E) is soft s*g-closed and (A, E) $\tilde{\subseteq}$ (B, E) $\tilde{\subseteq} \overline{(A, E)}$, then $\overline{(B, E)} -$ (B, E) contains no non empty soft semi closed set.

Proof.
It is a direct consequence of Theorem 3.13 and Theorem 3.17.

Theorem 3.21 Let $\tilde{X}$ be a finite soft T_1-space and (A,E) $\tilde{\subseteq}$ $\tilde{X}$. Then (A, E) is soft closed.

Proof.
For any soft subset (A, E) of $\tilde{X}$, (A, E) is a finite union of soft points of $\tilde{X}$. Since $\tilde{X}$ is soft T_1-space, the singleton of $\tilde{X}$ is soft closed and (A, E) is soft closed in $\tilde{X}$.

4. SOFT SEMI STAR GENERALIZED OPEN SETS

Definition 4.1 A soft set (A, E) is soft semi star generalized open (written shortly as soft s*g-open) if and only if (A, E)' is soft s*g-closed.

Example 4.2 In Example 3.2, (R, E) is soft s*g-open in (X, τ, E), where $R(e_1) = \{a\}$, $R(e_2) = \{a, b\}$.

Theorem 4.3 A soft set (A, E) is soft s*g-open if and only if $(F, E) \tilde{\subseteq} (A, E)^\circ$ whenever (F, E) is soft semi closed and $(F, E) \tilde{\subseteq} (A, E)$.

Proof.
Necessity: Let (A, E) be soft s*g-open and suppose $(F, E) \tilde{\subseteq} (A, E)$ where (F, E) is soft semi closed. Then by definition of soft s*g-open sets, (A, E)' is also soft s*g-closed. Also, $(A, E)' \tilde{\subseteq} (F, E)'$. This implies that $\overline{(A, E)'} \tilde{\subseteq} (F, E)'$. Now, $\overline{(A, E)'} = \left[(A, E)^0\right]'$ and hence $(F, E) \tilde{\subseteq} (A, E)^\circ$.

Sufficiency: If $(A, E)' \tilde{\subseteq} (U, E)$ and (U, E) is soft semi open in X, then $(U, E)' \tilde{\subseteq} (A, E)$ and (U, E)' is soft semi closed. Therefore,

$(U, E)' \tilde{\subseteq} (A, E)^o$ and $\overline{(A, E)}' = \left[(A, E)^0\right]'$. Hence (A, E)' is soft s*g-closed and hence (A, E) is soft s*g-open.

Remark 4.4 Every soft open set is soft s*g-open but the converse is not true in general. The following example supports our claim.

Example 4.5 In Example 3.5, (S, E) is soft s*g-open, but not soft open in (X, τ, E), where $R(e_1) = \{a, b\}$, $R(e_2) = \{a\}$.

Remark 4.6 Soft s*g-open sets and soft semi open sets are in general, independent as can be seen from the following example.

Example 4.7 In Example 3.16, the soft set (W, E) is soft semi open, but not soft s*g-open in (X, τ, E), where $W(e_1) = \{b, c\}$, $W(e_2) = \{a, b, c\}$. Also, (Y, E) is soft s*g-open, but not soft semi open in (X, τ, E), where $Y(e_1) = \phi$, $Y(e_2) = \{a\}$.

Remark 4.8 (A, E) $\tilde{\cup}$ (B, E) is not soft s*g-open in general for any two soft s*g-open sets (A, E) and (B, E). This can be seen from the following example.

Example 4.9 In Example 3.16, (T, E), (U, E) are soft s*g-open sets in (X, τ, E), where $T(e_1) = \{a, b\}$, $T(e_2) = \{a, c\}$, $U(e_1) = \{b, c\}$, $U(e_2) = \phi$. But (T, E) $\tilde{\cup}$ (U, E) = (V, E) is not soft s*g-open where $V(e_1) = \{a, b, c\}$, $V(e_2) = \{a, c\}$.

Theorem 4.10 If (A, E) and (B, E) are separated soft s*g-open sets then (A, E) $\tilde{\cup}$ (B, E) is soft s*g-open.

Proof.

Let (A, E) and (B, E) are separated soft s*g-open subsets of X. Let (F, E) be a soft semi closed set such that (F, E) $\tilde{\subseteq}$ (A, E) $\tilde{\cup}$ (B, E). Since (A, E) and (B, E) are separated sets, $\overline{(A, E)} \tilde{\cap} (B, E) = (A, E) \tilde{\cap} \overline{(B, E)} = \tilde{\phi}$. Now $(F, E) \tilde{\cap} \overline{(A, E)} \tilde{\subseteq} \left[(A, E) \tilde{\cup} (B, E)\right] \tilde{\cap} \overline{(A, E)} \tilde{\subseteq} (A, E) \tilde{\cup} \tilde{\phi} = (A, E)$.

Similarly, (F, E) $\tilde{\cap}\ \overline{(B, E)} \tilde{\subseteq}$ (B, E). Hence (F, E) $\tilde{\cap}\ \overline{(A, E)} \tilde{\subseteq} \tilde{\subseteq}$ (A, E)^o and (F, E) $\tilde{\cap}\ \overline{(B, E)} \tilde{\subseteq}$ (B, E)^o. Now (F, E) = (F, E) $\tilde{\cap} \left[(A, E) \tilde{\cup} (B, E)\right]$ = [(F,E) $\tilde{\cap}$ (A, E)] $\tilde{\cup}$ [(F, E) $\tilde{\cap}$ (B, E)] $\tilde{\subseteq} \left[(F, E) \tilde{\cap} \overline{(A, E)}\right] \tilde{\cup} \left[(F, E) \tilde{\cap} \overline{(B, E)}\right] \tilde{\subseteq}$ (A, E) $^o \tilde{\cup}$ (B, E) $^o \tilde{\subseteq} \left[(A, E) \tilde{\cup} (B, E)\right]^0$. Hence (A, E) $\tilde{\cup}$ (B, E) is soft s*g-open in X.

Proposition 4.11 If (A, E) and (B, E) are soft s*g-open sets then so is (A, E) $\tilde{\cap}$ (B, E).

Proof.
Let (F, E) $\tilde{\subseteq}$ (A, E) $\tilde{\cap}$ (B, E) where (F, E) is soft semi closed in X. Consequently, (F, E) $\tilde{\subseteq}$ (A, E) and (F, E) $\tilde{\subseteq}$ (B, E). Since (A, E) and (B, E) are soft s*g-open, (F, E) $\tilde{\subseteq}$ (A, E)^o and (F, E) $\tilde{\subseteq}$ (B, E)^o. Hence (F,E) $\tilde{\subseteq} \left[(A, E) \tilde{\cap} (B, E)\right]^0$. Therefore $(A, E) \tilde{\cap} (B, E)$ is softs*g-open in X.

Theorem 4.12 If (A, E) is soft s*g-open in X and (A, E)$^o \tilde{\subseteq}$ (B, E) $\tilde{\subseteq}$ (A, E), then (B, E) is soft s*g-open.

Proof.
Let (F, E) $\tilde{\subseteq}$ (B, E) where (F, E) is soft semi closed in X. This implies that (F, E) $\tilde{\subseteq}$ (A, E). Since (A, E) is soft s*g-open, (F, E) $\tilde{\subseteq}$ (A, E)^o. Now $(A, E)^o \tilde{\subseteq} (B, E)^o$. Hence $(F, E) \tilde{\subseteq} (B, E)^o$. Therefore, (B, E) is soft s*g-open.

Theorem 4.13 A soft set (A, E) is soft s*g-open if and only if $\overline{(A, E)} - (A, E)$ is soft s*g-open.

Proof.
Necessity: Suppose that (A, E) is soft s*g-closed and $(F, E) \tilde{\subseteq} \overline{(A, E)} - (A, E), (F, E)$ being soft semi closed in X. Then $(F, E) = \tilde{\phi}$ and hence $(F, E) \tilde{\subseteq} \left[\overline{(A, E)} - (A, E)\right]^0$.

Sufficiency: Suppose that $\overline{(\mathrm{A, E})} - (\mathrm{A, E})$ is soft s*g-open. Let (A, E) $\tilde{\subseteq}$ (O, E) where (O, E) is soft semi open in X. Then (O, E)' $\tilde{\subseteq}$ (A, E)' implies that $\overline{(\mathrm{A, E})} \tilde{\cap}$ (O, E)' $\tilde{\subseteq}$ $\overline{(\mathrm{A, E})} \tilde{\cap}$ (A, E)' = $\overline{(\mathrm{A, E})} -$ (A, E). Since $\overline{(\mathrm{A, E})} \tilde{\cap}$ (O, E)' is soft semi closed in X, $\overline{(\mathrm{A, E})} \tilde{\cap}$ (O, E)' $\tilde{\subseteq}$ $\left[\overline{(\mathrm{A, E})} - (\mathrm{A, E})\right]^0 = \left[\overline{(\mathrm{A, E})} \tilde{\cap} (\mathrm{A, E})'\right]^0 = \tilde{\phi}$. Hence $\overline{(\mathrm{A, E})} \tilde{\subseteq}$ (O, E) and (A, E) is soft s*g-closed. This proves the theorem.

5. SOFT S*GO-COMPACTNESS

Definition 5.1 Let B $\subseteq$ X. Then, $\tilde{\mathrm{B}}$ is soft S*GO-compact relative to (X, τ, E) if every cover of $\tilde{\mathrm{B}}$ by soft s*g-open subsets of (X, τ, E) has a finite subcover.

Proposition 5.2 Soft S*GO-compactness implies soft compactness.

Proof.
Let B $\subseteq$ X and $\tilde{\mathrm{B}}$ is soft S*GO-compact relative to (X, τ, E). Let $\{(\mathrm{A_i}, \mathrm{E}): \mathrm{i} \in \wedge\}$ be a soft open cover of (B, E). Since every soft open set is soft s*g-open, this cover is a soft s*g-open cover of $\tilde{\mathrm{B}}$. Hence there exist a finite subset $\wedge_0$ of $\wedge$ such that $\tilde{\mathrm{B}} \tilde{\subseteq} \tilde{\bigcup} \left\{(\mathrm{A_i}, \mathrm{E}): \mathrm{i} \in \wedge_0\right\}$. Therefore $\tilde{\mathrm{B}}$ is soft compact relative to X.

6. CONCLUSION

Thus, we have introduced the concept of soft semi star generalized closed sets soft S*GO-compactness in soft topological spaces and studied some basic properties of them. In future, the study on separation axioms, locally closed sets and continuous mappings with the help of soft s*g-closed sets may be carried out.

REFERENCES

Atanassov, K. (1986). Intuitionistic fuzzy sets. *Fuzzy Sets and Systems*. **20**: 87-96.

Atanassov, K. (1994). Operators over interval valued intuitionistic fuzzy sets. *Fuzzy Sets and Systems*. **64**: 159-174.

Chandrasekhara Rao, K., and Joseph, K. (2000). Semi star generalized closed sets. *Bulletin of Pure and Applied Sciences*. **19E**(2): 281-290.

Chen, D. (2005). The parametrization reduction of soft sets and its applications. *Computers and Mathematics with Applications*. **49**: 757-763.

Gorzalzany, M.B. (1987). A Method of inference in approximate reasoning based on interval-valued fuzzy sets. *Fuzzy Sets and Systems*. **21**: 1-17.

Kannan, K. (2012). Soft generalized closed sets in soft topological spaaces. *Journal of Theoretical and Applied Information Technology*. **37**(1): 17-21.

Kannan, K. (2012). On Levine's generalized closed sets: a survey. *Journal of Applied Sciences, Engineering and Technology*. **4**(11): 1612-1615.

Levine, N. (1970). Generalized closed sets in topology. *Rendiconti del Circolo Matematico di Palermo*. **19**(2): 89-96.

Maji, P. K., Biswas, R. and Roy, R. (2002). An application of soft sets in a decision making problem. *Computers and Mathematics with Applications*. **44**: 1077-1083.

Maji, P. K., Biswas, R. and Roy, R. (2003). Soft set theory. *Computers and Mathematics with Applications*. **45**: 555-562.

Molodtsov, D. (1999). Soft set theory first results. *Computers and Mathematics with Applications*. **37**: 19-31.

Muhammad Shabir and Munazza Naz. (2011). On soft topological spaces. *Computers and Mathematics with Applications*. **61**: 1786-1799.

Pawlak, Z. (1982). Rough sets. *International Journal of Computer and Information Sciences*. **11**(5): 341-356.

Pie, D. and Miao, D. (2005). From soft sets to information systems. *Granular Computing, 2005 IEEE International Conference.* **2**: 617-621.

Zadeh, L. A. (1965). Fuzzy Sets. *Information and Control*. **8**: 338-353.