A NEW NOTION OF GENERALIZED CLOSED SETS IN SOFT TOPOLOGICAL SPACES

S. PIOUS MISSIER*1, S. JACKSON2

1Associate Professor, P.G. & Research Department of Mathematics, V. O. Chidambaram College, Thoothukudi, India-628008.

2Research Scholar, P.G. & Research Department of Mathematics, V. O. Chidambaram College, Thoothukudi, India-628008.

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ABSTRACT

In this paper a new class of soft generalized closed sets called Soft JP Closed sets in soft topological spaces is introduced and studied. This new class is defined over an initial universe and with a fixed set of parameters. Some basic properties of this new class of soft sets are investigated. Also this new class of sets compared with some of the existing soft sets to prove its own unique identity. This new class of soft JP-Closed sets contributes to widening the scope of Soft Topological Spaces and its applications.

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1. INTRODUCTION

Any Research work should result in addition to the existing knowledge of a particular concept. Such an effort not only widens the scope of the concept but also encourages others to explore new and newer ideas. Molodtsov (1999) [8] initiated the theory of soft sets as a new mathematical tool for dealing uncertainty, which is completely a new approach for modeling vagueness and uncertainties. Soft set theory has a rich potential for application involving practical problems in Economics, Social Sciences, Medical Sciences etc. Applications of Soft set theory in other disciplines and in real life problems are now catching momentum. Molodtsov [8] successfully applied Soft set theory into several directions, such as Smoothness of Functions, Game theory, Operations Research, Riemann Integration, Perron Integration, Theory of Probability, Theory of Measurement and so on. Shabir and Naz (2011) [10] introduced the notion of soft topological spaces which are defined over an initial universe with a fixed set of parameters. They studied some basic concepts of soft topological spaces also some related concepts such as soft interior, soft closure, soft subspace and soft separation axioms.


Modern topology depends strongly on the ideas of set theory. Therefore, in this work, we introduce a new soft generalized set called Soft JP Set, and its related properties. This may be another starting point for the new soft mathematical concepts and structures that are based on soft set-theoretic operations.

2. PRELIMINARIES

In this section, we present the basic definitions and results of soft set theory which may be found in earlier studies [7, 8, 10, 12]. Throughout this work, $U$ refers to an initial universe, $E$ is a set of parameters, $P(U)$ is the power set of $U$, and $A \subseteq E$. 

Corresponding Author: S. Pious Missier*1

1Associate Professor, P.G. & Research Department of Mathematics, V. O. Chidambaram College, Thoothukudi, India-628008.
Definition 2.1 [8]: A soft set $F_x$ on the universe $U$ is defined by the set of ordered pairs $F_x = \{(x, f_x(x)) : x \in E\}$, where $f_x : E \rightarrow P(U)$ such that $f_x(x) = \emptyset$ if $x \notin A$. Here $f_x$ is called an approximate function of the soft set $F_x$. The value of $f_x$ may be arbitrary, some of them may be empty, and some may have non empty intersection.

Example 2.2 [10]: Suppose there are five cars in the universe. Let $U = \{c_1, c_2, c_3, c_4, c_5\}$ under consideration and that $E = \{x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8\}$ stand for the parameters expensive, beautiful, manual gear, cheap, automatic gear, in good repair, in bad repair and costly respectively. In this case to define a soft set means to point out expensive cars, beautiful cars and so on. It means that in the mapping $f_x$ given by “cars, (.)” where (.) to be filled in by one of the given parameters $x_i \in E$.

Let $A \subseteq E$, the soft set $F_x$ that describes the “attractiveness in cars” in the opinion of a buyer may be defined like $A = \{x_2, x_3, x_4, x_5\}$, $f_x(x_2) = \{c_2, c_3, c_5\}$, $f_x(x_3) = \{c_2, c_4\}$, $f_x(x_4) = \{c_1\}$, $f_x(x_5) = \{U\}$. Then collection of the above approximations is called as soft set $F_x = \{(x_2, \{c_2, c_3, c_5\}), (x_3, \{c_2, c_4\}), (x_4, \{c_1\}), (x_5, \{U\})\}$.

Definition 2.3 [7]: A soft set $(F, A)$ over $X$ is said to be Null Soft Set denoted by $F_x$ if for all $e \in A$, $F(e) = \emptyset$. A soft set $(F, E)$ over $X$ is said to be an Absolute Soft Set denoted by $F_x$ if for all $e \in A$, $F(e) = X$.

Definition 2.4 [4]: The Union of two soft sets $(F, A)$ and $(G, B)$ over $X$ is the soft set $(H, C)$, where $C = A \cup B$, and for all $e \in C$, $H(e) = F(e)$, if $e \in A \cap B$, $H(e) = G(e)$ if $e \in B \setminus A$, and $H(e) = F(e)$ if $e \in A \setminus B$. and is denoted as $(F, A) \cup (G, B) = (H, C)$.

Definition 2.5 [10]: The Intersection of two soft sets $(F, A)$ and $(G, B)$ over $X$ is the soft set $(H, C)$, where $C = A \cap B$ and for all $e \in C$, $H(e) = F(e)$ if $e \in A \cap B$, $H(e) = G(e)$ if $e \in B \setminus A$, and $H(e) = F(e)$ if $e \in A \setminus B$. and is denoted as $(F, A) \cap (G, B) = (H, C)$.

Definition 2.6 [10]: The Relatively Complement of $(F, A)$ is denoted by $(F, A)^c$ and is given by $(F, A)^c = (F', A)$ where $F' : A \rightarrow P(X)$ is a mapping given by $F'(e) = X \setminus F(e)$ for all $e \in A$.

Definition 2.7 [10]: The Difference of two soft sets $(F, E)$ and $(G, E)$ over $X$, denoted by $(F, E) \setminus (G, E)$ is defined as $H(e) = F(e) \setminus G(e)$ for all $e \in E$.

Definition 2.8 [8]: Let $(F, A)$ and $(G, B)$ be soft sets over $X$, we say that $(F, A)$ is a Soft Subset of $(G, B)$ if $A \subseteq B$ and for all $e \in A$, $F(e)$ and $G(e)$ are identical approximations. We write $(F, A) \subseteq (G, B)$.

Definition 2.9 [10]: Let $\tau$ be a collection of soft sets over $X$ with the fixed set $E$ of parameters. Then $\tau$ is called a Soft Topology on $X$ if

i. $\Phi, X$ belongs to $\tau$.

ii. The union of any number of soft sets in $\tau$ belongs to $\tau$.

iii. The intersection of any two soft sets in $\tau$ belongs to $\tau$.

The triplet $(X, \tau, E)$ is called Soft Topological Spaces over $X$.

The members of $\tau$ are called Soft Open sets in $X$ and complements of them are called Soft Closed sets in $X$.

Definition 2.10[10]: Let $(X, \tau, E)$ be a Soft Topological Spaces over $X$. The Soft Interior of $(F, E)$ denoted by $\text{Int}(F, E)$ is the union of all soft open subsets of $(F, E)$. Clearly $\text{Int}(F, E)$ is the largest soft open set over $X$ which is contained in $(F, E)$.

The Soft Closure of $(F, E)$ denoted by $\text{Cl}(F, E)$ is the intersection of soft closed sets containing $(F, E)$. Clearly $(F, E)$ is the smallest soft closed set containing $(F, E)$.

i. $\text{Int}(F, E) = \bigcup \{(O, E) : (O, E)$ is soft open and $(O, E) \subseteq (F, E)\}$.

ii. $\text{Cl}(F, E) = \bigcap \{(O, E) : (O, E)$ is soft closed and $(F, E) \subseteq (O, E)\}$.

Definition 2.11: A Subset of a soft topological space $(X, \tau, E)$ is said to be


2. a soft Pre-Open set [1] if $(A, E) \subseteq \text{Int}(\text{Cl}(A, E))$ and a Soft Pre-Closed set if $\text{Cl}(\text{Int}(A, E)) \subseteq (A, E)$.

3. a soft a-Open set [1] if $(A, E) \subseteq \text{Int}(\text{Cl}(A, E))$ and a Soft a-Closed set if $\text{Cl}(\text{Int}(A, E)) \subseteq (A, E)$.

a Soft generalized Closed set[briefly Soft g-Closed][6] if Cl(A,E) ⊆ (U,E) whenever (A,E) ⊆ (U,E) and (U,E) is soft Open in (X, τ, E). The complement of a Soft g-Closed set is called a Soft g-Open set.

6) a Soft Semi-gener alized Closed set[briefly Soft Sg-Closed] if SCl(A, E) ⊆ (U,E) whenever (A,E) ⊆ (U,E) and (U,E) is soft semi Open in (X, τ, E). The complement of a Soft Sg-Closed set is called a Soft Sg-Open set.


8) a Soft g-Closed[9] if Cl(A,E) ⊆ (U,E) whenever (A,E) ⊆ (U,E) and (U,E) is soft semi Open in (X, τ, E). The complement of a Soft g-Closed set is called a Soft g-open set.

9) a Soft alpha-generalized Closed set[briefly Soft ag-Closed] if αCl(A,E) ⊆ (U,E) whenever (A,E) ⊆ (U,E) and (U,E) is soft Open in (X, τ, E). The complement of a Soft ag-Closed set is called a Soft ag-Open set.

10) a Soft generalized alpha Closed set[briefly Soft ga-Closed] if αCl(A,E) ⊆ (U,E) whenever (A,E) ⊆ (U,E) and (U,E) is soft Open in (X, τ, E). The complement of a Soft ga-Closed set is called a Soft ga-Open set.

11) a Soft generalized pre Closed set[briefly Soft gp-Closed] [1] if pCl(A,E) ⊆ (U,E) whenever (A,E) ⊆ (U,E) and (U,E) is soft Open in (X, τ, E). The complement of a Soft gp-Closed set is called a Soft gp-Open set.


III: SOFT JP CLOSED SET

Definition 3.1: Let (X, τ, E) be a soft topological space. A Soft set(F,E) is called soft JP closed set if Scl(F,E) ⊆ Int(U,E) whenever (F,E) ⊆ (U,E) and (U,E) is soft g-open. The set of all soft JP closed sets is denoted by SJPC(X).

Example 3.2: Let X={x1,x2,x3} E={e1,e2} and τ=\{Φ, X, (F1, E),(F2,E), (F3,E), (F4,E), (F5,E), (F6,E)} where (F1, E), (F2,E), (F3,E), (F4,E), (F5,E), (F6,E) defined as follows

F1(e1) = {x2}, F1(e2) = {x1}, F2(e1) = {x2}, F2(e2) = {x1, x3}, F3(e1) = {x1, x2}, F3(e2)=X, F4(e1) = {x2, x3}, F4(e2)= {x1}, F5(e1) = {x2, x3}, F5(e2) = {x1, x3}, F6  (e1) =X, F6 (e2) = {x1, x2}. Then (F,E) defines a soft topology on X. Define a soft set (G,E) such that G(e1) = {x1, x3} G(e2)= {x1} .Then (G,E) is a soft JP closed set in (X, τ, E).

Lemma 3.3[11]: A Set is g-open if and only if F ⊆ Int(A) when ever F is semi closed and F ⊆ A.

Proposition 3.4: Every soft semi closed set is soft JP closed set but not conversely.

Proof: let (F,E) be a soft semi closed set in the soft topological space (X, τ, E) and (U,E) be a soft g-open set such that (F,E) ⊆ (U,E). Then by Lemma 3.3, (F, E) =Scl(F,E) ⊆ Int(U,E).Then (F,E) is soft JP closed set.

Example 3.5: In the soft topological space(X, τ, E), X={x1, x2} E={e1,e2} and τ=\{Φ, X, (F1, E),(F2,E)} where (F1, E), (F2,E) defined as follows

F1(e1) = \{x1\}  F1(e2) = \{x1\}
F2(e1) = \{x1\}  F2(e2) = \{x1\}.

Then the soft set (H, E) defined by H(e1) = \{x1\}, H (e2) = X is a soft JP closed set but not soft semi closed in (X, τ, E).

Proposition 3.6: Every soft closed set is soft JP closed set but not conversely.

Proof: let (F, E) be a soft closed set in the soft topological space (X, τ, E). Then it is a soft semi closed set. Then by Proposition 3.4, (F, E) is soft JP closed set.

Example 3.7: In the soft topological space (X, τ, E) defined in example 3.5, the soft set (G, E) such that G (e1) = \{x1\} G(e2)= X is a soft JP closed set but not soft closed in (X, τ, E).

Proposition 3.8: Every soft a closed set is soft JP closed set but not conversely.
Proof: let \((F, E)\) be a soft \(\alpha\) closed set in the soft topological space \((X, \tau, E)\). Then it is a soft semi closed set. Then by Proposition 3.4, \((F, E)\) is soft JP closed set.

**Example 3.9:** In the soft topological space \((X, \tau, E)\) defined in example 3.5, the soft set \((G, E)\) such that \(G(e_1) = \{x_2\}\) \(G(e_2) = X\) is a soft JP closed set but not soft \(\alpha\) closed in \((X, \tau, E)\).

**Proposition 3.10:** Every soft JP closed set is soft gs closed set but not conversely.

**Proof:** Let \((F, E)\) be a soft JP closed set in the soft topological space \((X, \tau, E)\). We know that every soft open is soft \(\hat{g}\) open. Therefore \((F, E)\) is soft gs closed set.

**Example 3.11:** In the soft topological space \((X, \tau, E)\) defined in example 3.5, the soft set \((G, E)\) such that \(G(e_1) = \{x_2\}\), \(G(e_2) = \{x_1\}\) is a soft gs closed set but not soft JP closed in \((X, \tau, E)\).

**Example 3.12:** The following examples show that soft \(g\) closedness and soft JP closedness are independent.

In the soft topological space \((X, \tau, E)\) defined in example 3.2, the soft set \((G, E)\) such that \(G(e_1) = \{x_1, x_2\}\) \(G(e_2) = \phi\) is a soft JP closed set but not soft \(g\) closed in \((X, \tau, E)\). Also the soft set \((H, E)\) such that \(H(e_1) = \{x_1\}\), \(H(e_2) = X\) is a soft \(g\) closed set but not soft JP closed in \((X, \tau, E)\).

**Example 3.13:** The following examples show that soft \(\hat{g}\) closedness and soft JP closedness are independent.

In the soft topological space \((X, \tau, E)\) \(X = \{a, b\}\) \(E = \{e_1, e_2\}\) and \(\tau = \{\emptyset, \bar{X}, (F_1, E), (F_2, E), (F_3, E)\}\) where \((F_1, E), (F_2, E), (F_3, E)\) defined as follows: \(F_1(e_1) = \emptyset, F_1(e_2) = \{a\}\), \(F_2(e_1) = \{b\}\), \(F_2(e_2) = \emptyset\), \(F_3(e_1) = \{b\}\), \(F_3(e_2) = \{a\}\).

The soft set \((G, E)\) such that \(G(e_1) = \{b\}\), \(G(e_2) = \emptyset\) is soft JP closed but not soft \(\hat{g}\) closed in \((X, \tau, E)\). Also the soft set \((H, E)\) such that \(H(e_1) = \{b\}\), \(H(e_2) = \{a\}\) is soft \(\hat{g}\) closed but not soft JP closed in \((X, \tau, E)\).

**Example 3.14:** The following examples show that soft \(g\) closedness and soft JP closedness are independent.

In the soft topological space \((X, \tau, E)\) defined in example 3.5, the soft set \((G, E)\) such that \(G(e_1) = \emptyset\), \(G(e_2) = \{x_1, x_2\}\) is a soft JP closed set but not soft \(g\) closed in \((X, \tau, E)\). Also in the soft topological space \((X, \tau, E)\) defined in example 3.2, the soft set \((H, E)\) such that \(H(e_1) = \{x_2\}\), \(H(e_2) = \{x_1\}\) is a soft \(g\) closed set but not soft JP closed in \((X, \tau, E)\).

**Example 3.15:** The following examples show that soft pre closedness, soft \(\alpha g\) closedness, soft \(\beta\) closedness, soft \(g\alpha\) closedness, soft \(gp\) closedness, soft \(gpr\) closedness and soft JP closedness are independent.

In the soft topological space \((X, \tau, E)\) defined in example 3.13, the soft set \((G, E)\) such that \(G(e_1) = \{a\}\), \(G(e_2) = \emptyset\) is a soft pre closed (resp. soft \(\alpha g\) closed, soft \(\beta\) closed, soft \(g\alpha\) closed, soft \(gp\) closed and soft \(gpr\) closed) but not soft JP closed. Also the soft set \((H, E)\) such that \(H(e_1) = \{b\}\), \(H(e_2) = \emptyset\) is a soft JP closed set but not soft pre closed (resp. soft \(\alpha g\) closed, soft \(g\alpha\) closed, soft \(gp\) closed and soft \(gpr\) closed). Also in the soft topological space \((X, \tau, E)\) defined in example 3.5, the soft set \((I, E)\) such that \(I(e_1) = \emptyset\), \(I(e_2) = X\) is a soft JP closed set but not soft \(\beta\) closed.

The following diagram shows the above discussions.
Example 3.16: The Soft intersection of two soft JP closed sets need not to be a soft JP closed set.

In the soft topological space (X, τ, E) defined in example 3.13, the soft sets (G, E), (H, E) such that G(e₁) = {a}, G(e₂) = {a} and H(e₁) = {b}, H(e₂) = {b} are soft JP closed sets but their intersection (G, E) ∩ (H, E) = (I, E) where I(e₁) = {a}, I(e₂) = {b} is not a soft JP closed set in (X, τ, E).


In the soft topological space (X, τ, E) defined in example 3.2, the soft sets (G, E), (H, E) such that G(e₁) = {x₁, x₃} G(e₂) = φ, H(e₁) = φ H(e₂) = {x₁} are soft JP closed sets but the union (G, E) ∪ (H, E) = (A, E) where A(e₁) = {x₁, x₃}, A(e₂) = {x₁} is not a soft JP closed set in (X, τ, E).

Definition 3.18[3]: Let (X, τ, E) be a soft topological space and (A, E) be a soft subset over X. Then the set of all soft semi limit points is called soft semi derived set of (A, E) and is denoted by DS[A, E].


Theorem 3.20: Let (F, E) be a soft JP closed subset of the soft topological space (X, τ, E). Then Scl(F, E)∩(F, E) contains no non empty soft closed set in (X, τ, E) but not conversely.


Example 3.21: In the soft topological space (X, τ, E) defined in example 3.13, the soft set (G, E) such that G(e₁) = {a}, G(e₂) = φ, then Scl(G, E) = (G, E) does not contain any non empty closed set but it is not soft JP closed.

Theorem 3.22: Let (F, E) be a soft JP closed subset of the soft topological space (X, τ, E). Then Scl(F, E)∩(F, E) contains no non empty soft *g* closed set in (X, τ, E) but not conversely.


Example 3.23: In the soft topological space (X, τ, E) defined in example 3.13, the soft set (G, E) such that G(e₁) = φ, G(e₂) = {a}, then Scl(G, E) = (G, E) does not contain any non empty soft *g* closed set but it is not soft JP closed.

Theorem 3.24: In a soft topological space (X, τ, E) each singleton set (A, E) is either soft *g* closed in X or it’s complement is soft JP closed set.

Proof: If (A, E) is not soft *g* closed then the only soft *g* open set containing (A, E) is X. Then Scl((A, E)*) = X. Therefore Scl((A, E)*) is soft JP closed. Hence the proof.

Theorem 3.25: In a soft topological space (X, τ, E), if (A, E) is both soft *g* open and soft JP closed then it is soft semi closed.


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Theorem 3.26: Let \((A, E)\) and \((B, E)\) be two soft subsets of a soft topological space \((X, \tau, E)\). If \((A, E)\) is soft JP closed set and \((A, E) \subseteq (B, E) \subseteq \text{Scl}((A, E))\) Then \((B, E)\) is Soft JP Closed set.

**Proof:** Let \((U, E)\) be a soft \(\Phi\) open set in \((X, \tau, E)\) and \((B, E) \subseteq (U, E)\). Since \((A, E) \subseteq (U, E)\) and \((A, E)\) is soft JP closed set \(\text{Scl}((A, E)) \subseteq \text{Int}(U, E)\). Now, \(\text{Scl}(B, E) \subseteq \text{Scl}(\text{Scl}(A, E)) = \text{Scl}(A, E) \subseteq \text{Int}(U, E)\). Hence \((B, E)\) is Soft JP Closed set.

IV. SOFT JP OPEN SET

**Definition 4.1:** Let \((X, \tau, E)\) be a soft topological space. A soft set \((F, E)\) is called soft \(\text{JP Open}\) set if its complement is Soft JP closed set. The collection of all soft JP open sets is denoted by \(\text{SJPO}(X)\).

**Example 4.2:** In the soft topological space \((X, \tau, E)\), \(X=\{x_1, x_2, x_3\}\) and \(\tau=\{\Phi, X, (F_1, E), (F_2, E)\}\) where \((F_1, E)\), \((F_2, E)\) defined as follows \(F_1(e_1) = \{x_1\}\), \(F_1(e_2) = \{x_1\}\), \(F_2(e_1) = \{x_2\}\), \(F_2(e_2) = \{x_1, x_3\}\), \(F_3(e_1) = \{x_2\}\), \(F_3(e_2) = \{x_1\}\), \(F_4(e_1) = \{x_1, x_2\}\), \(F_4(e_2) = X\), \(F_5(e_1) = \{x_2, x_3\}\), \(F_5(e_2) = \{x_1\}\), \(F_6(e_1) = \{x_2, x_3\}\), \(F_6(e_2) = \{x_1, x_3\}\). Then \(\tau\) defines a soft topology on \(X\).

1. The soft set \((G, E)\) defined by \(G(e_1) = \{x_2, x_3\}\), \(G(e_2) = X\) is a soft JP open set but not soft open.
2. The soft set \((H, E)\) defined by \(H(e_1) = \{x_1\}\), \(H(e_2) = \{x_1, x_3\}\) is a soft JP open set but not soft semi open (resp. soft \(\alpha\) open).
3. The soft set \((I, E)\) defined by \(I(e_1) = \{x_1, x_2\}\), \(I(e_2) = \Phi\) is a soft gs open set but not soft JP open.

**Example 4.5:** The following examples show that soft g Openness and soft JP Openness are independent.

In the soft topological space \((X, \tau, E)\) defined in the example, the soft set \((G, E)\) such that \(G(e_1) = \{x_2\}\), \(G(e_2) = X\) is a soft JP open set but not soft g open in \((X, \tau, E)\). Also the soft set \((H, E)\) such that \(H(e_1) = \{x_1, x_2\}\), \(H(e_2) = \{x_1, x_3\}\) is a soft g open set but not soft JP open in \((X, \tau, E)\).

**Example 4.6:** The following examples show that soft sg Openness and soft JP Openness are independent.

In the soft topological space \((X, \tau, E)\) defined in example 4.2, the soft set \((G, E)\) such that \(G(e_1) = X\), \(G(e_2) = \{x_1, x_2\}\) is a soft JP open set but not soft sg open in \((X, \tau, E)\). Also in the soft topological space \((X, \tau, E)\) defined in example 4.4, the soft set \((H, E)\) such that \(H(e_1) = \{x_1, x_2\}\), \(H(e_2) = \{x_1, x_3\}\) is a soft g open set but not soft JP open in \((X, \tau, E)\).

**Example 4.7:** The following examples show that soft \(\hat{g}\) Openness and soft JP Openness are independent.

In the soft topological space \((X, \tau, E)\) defined in example 3.10, The soft set \((G, E)\) such that \(G(e_1) = \{a\}\), \(G(e_2) = X\) is soft JP open but not soft \(\hat{g}\) open in \((X, \tau, E)\). Also the soft set \((H, E)\) such that \(H(e_1) = \{a\}\), \(H(e_2) = \{b\}\) is soft \(\hat{g}\) open but not soft JP open in \((X, \tau, E)\).

**Example 4.8:** The following examples show that soft pre openness, soft \(\alpha g\) openness, soft \(\beta\) openness, soft ga openness, soft gp openness, soft gpr openness and soft JP openness are independent.

In the soft topological space \((X, \tau, E)\) defined in example 3.13, the soft set \((G, E)\) such that \(G(e_1) = \{x_2, x_3\}\), \(G(e_2) = X\) is a soft pre open (resp. soft \(\alpha g\) open, soft \(\beta\) open, soft ga open, soft gp open and soft gpr open) but not soft JP open. Also the soft set \((H, E)\) such that \(H(e_1) = \{x_1, x_3\}\), \(H(e_2) = X\) is a soft JP open set but not soft pre open (resp. soft \(\alpha g\) open, soft ga open, soft gp open and soft gpr open). In the soft topological space \((X, \tau, E)\) defined in example 3.5, the soft set \((J, E)\) such that \(J(e_1) = X\), \(J(e_2) = \Phi\) is a soft JP open set but not soft \(\beta\) open.

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The following diagram shows the above discussions.

**Example 4.9:** The soft Union of two soft JP open sets is need not to be a soft JP open set.

In the soft topological space \((X, \tau, E)\) defined in example 3.10, the soft sets \((G, E)\), \((H, E)\) such that \(G(e_1) = \{b\}, G(e_2) = \{b\}\) and \(H(e_1) = \{a\}, H(e_2) = \{a\}\) are soft JP closed sets but their union \((G, E) \bigcup (H, E) = (I, E)\) where \(I(e_1) = \{b\}, I(e_2) = X\) is not a soft JP open set in \((X, \tau, E)\).

**Example 4.10:** The soft intersection of two soft JP open sets is need not to be a soft JP open set.

In the soft topological space \((X, \tau, E)\) defined in example 3.2, the soft sets \((G, E)\), \((H, E)\) such that \(G(e_1) = \{x_1\}\), \(G(e_2) = X\), \(H(e_1) = X\), \(H(e_2) = \{x_1, x_2\}\) are soft JP open sets but the intersection \((G, E) \bigcap (H, E) = (J, E)\) where \(J(e_1) = \{x_2\}, J(e_2) = \{x_1, x_2\}\) is not a soft JP open set in \((X, \tau, E)\).

**Theorem 4.11:** Let \((A, E)\) and \((B, E)\) be two soft subsets of a soft topological space \((X, \tau, E)\), If \((A, E)\) is soft JP Open set and \(\text{SInt}(A, E) \subseteq (B, E) \subseteq (A, E)\) Then \((B, E)\) is Soft JP Open set.


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VI. REFERENCES


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