# Soft Simply Connected Spaces And Soft Simply Paracompact Spaces

# Soft Simply Connected Spaces And Soft Simply Paracompact Spaces

S. Noori[1] and Y. Y. Yousif [2]

[1] Department of Mathematics, College of Education for Pure Sciences

(Ibn- Al-Haitham), University of Baghdad

[2] Department of Mathematics, College of Education for Pure Sciences

(Ibn- Al-Haitham), University of Baghdad

sarah.asas90@gmail.com

yoyayuosif@yahoo.com

**Abstract:** We introduce in this paper some new concepts in soft topological spaces such as soft simply separated, soft simply disjoint, soft simply division, soft simply limit point and we define soft simply connected spaces, and we presented soft simply Paracompact spaces and studying some of its properties in soft topological spaces. In addition to introduce a new types of functions known as soft simply $pu$-continuous which are defined between two soft topological spaces**.**

**Keywords:** soft simply-connected, soft simply $pu$-continuous, soft simply limit point**,** soft simply Paracompact spaces.

**MSC2010: 54A05, 54A∅10, 54D05, 54D10.**

**1. Introduction:**

In 1999 the concept of soft set theory was used for the first time as a mathematical tool by$Molodtsov$ [1] to deal with confusion. He determinant the primal upshots of this new theory and successfully applied the soft set theory in many ways such as theory of measurement smoothness of functions, game theory, etc. In last year research work on soft set theory is taking place rapidly. In 2003 $Maji$ et al, presented many basic notions of soft set theory like universe soft set and empty soft set [2]. In 2011 $Shabir$ and $Naz$ discussed the theory of soft topological spaceand many fundamental concepts of soft topological spaces including soft open, soft closed sets, soft nbd oft subspace, and soft separation axioms [3]. In 2012 $Ayg$ünoğ$lu$ and $Ayg$ün mentioned soft continuity of soft function, and theystudied soft product topology, etc in soft topological spaces [4]. In 2011 $Min$ discussed some findings on soft topological spaces [5].In 1975 the concept of simply-open sets was introduced by $Neubrunnova$ [6] if ( $H = K \cup N$ such that $K$ is open set and $N$ is $nowhere\ dense$ ( $N$ is $nowhere\ dense$ if $(cl(int\ N) = \emptyset$ [7])), it symbolizes by $S^M O(X)$ .In 2013 El. $sayed$ and $Noamman$ presented transformed definition of simply open set [8] if ($O \subset (X, \tau)$ is simply open set if $int\big(cl(O)\big) \subseteq cl(int(O))$. In 2017 $El.Sayed$ and $El.Bably$ introduce a new class of simply open sets as a generalization and modification for soft open sets called soft simply open set [9]. In 2014$J.Subhashinin$ et al [10] have studied soft connectedness in soft topological spaces and

$Bin\ Chen$ [11] continued studying some properties of soft semi-open sets. We built on some of the results in [15], [16], [17], [18], [19]. [20] and [21].

The purpose of this paper is to introduce new concepts in soft topological spaces like soft simply disjoint, soft simply separated, soft simply division,$SS^M - connected$, soft simply $pu$-continuous, soft simply limit point**,** and defined soft simply Paracompact spaces.

**1.preliminaries:**

The following concepts and definition with some results are need it later on

**Definition 1.1: [1]** Let $U$defined as a universe set and $E$ as a parameter set with power set of $U$ is denotes by $P(U)$and $A\ c\ E$. Then $(F, A)$ is said to be a soft set, such that $F: A \to P(U)$**;** $F(a) \in P(U), \forall a \in A$.

**Definition 1.2:[2]**We say $(F, A)$is a null set and it symbolizes by$\widetilde{\Phi}$, if$F(a) = \emptyset, \forall a \in A$.

**Definition 1.3:[2]** We say $(F, A)$ is a absolute soft set and it symbolizes by$\tilde{A}, if\ F(a) = U, \forall a \in A$.

**Definition 1.4:[2]**Let $(F, A)$and $(G, B)$ are two soft set then $(F, A) \ \tilde{\cup}\ (\mathrm{G}, \mathrm{B})$=$(H, C)$; ($i.e$ the union of these sets are also soft set), where $C = A \ \tilde{\cup}\ B$ and for each $e \in C$

$$H(e)=\begin{cases} F(e) & if\ e \in A - B \\ G(e) & if\ e\ \in B - A \\ F(e) \cup G(e) & if\ e \in A \cap B \end{cases}$$

**Definition 1.5:[2]** Let $(F, A)$ and $(G, B)$ be two soft set then $(F, A) \ \tilde{\cap}\ (\mathrm{G}, \mathrm{B}) = (H, C)$; ($i.e$ the intersection of these sets are also soft set), where $C = A \ \tilde{\cap}\ B$ and for each $e \in C$such that$H(e) = F(e) \cap G(e)$.

**Definition 1.6:[2]** Let $(F, A)$ and $(\mathrm{G}, \mathrm{B})$ be two soft sets over $U$, then$(F, A) \ \tilde{\subset}\ (\mathrm{G}, \mathrm{B})$**,** if$A \subset B$ and $F(e) \subset G(e)\ \forall\ e \in A$,

**Definition 1.7:[12]** The soft topology $\tilde{\tau}$ defined as follows:

1. $\widetilde{U}$ and $\widetilde{\emptyset} \in \tilde{\tau}$
2. Thesoft union of any number of soft sets in $\tilde{\tau} \in \tilde{\tau}$.
3. The soft intersection of any two soft sets in $\tilde{\tau} \in \tilde{\tau}$.

Then the triplet $(U, \tilde{\tau}, E)$ is said to be a soft topological space, and the elements of $\tilde{\tau}$are called soft open and their complements are soft closedand we denoted of each closed soft sets by $\tilde{\mathcal{F}}$.

**Definition 1.8:[12]** Assume that $(F, E)$ be a soft set of $(U, \tilde{\tau}, E)$ is called soft neighborhood (briefly soft $nbd$ ) subset$(H, E)$if $\exists\ (K, E) \ \tilde{\in}\ \tilde{\tau}$; $(H, E) \ \tilde{\subseteq}\ (K, E) \ \tilde{\subseteq}\ (F, E)$.

**Definition 1.9:[12]** $(F, E)^o$ or $sint((F, E))$ is the soft interior of the set $(F, E)$, is adefined as follows:

$sint\big((F, E)\big)$ =$\tilde{\cup}$ $\{(G, E);\ (F, E) \ \tilde{\supseteq}\ (G, E), (G, E) \ \tilde{\in}\ \tilde{\tau}\}$.

**Definition 1.10:[12]** $\overline{(F,E)}$is a soft closure of a$(F,E)$, is a soft set defined as follows:

$scl\big((F,E)\big) = \tilde{\cap}\ \{(G,E);\ (F,E)\ \tilde{\subseteq}\ (G,E), (G,E)^{C}\ \tilde{\in}\ \tilde{\tau}\}$.

**Definition 1.11:[12]**We say$(U,\tilde{\tau},E)$ is a soft indiscrete space if $\tilde{\tau} = \{\tilde{U},\tilde{\emptyset}\}$, and it symbolizes by $\tilde{\tau}_{ind}$.

**Definition 1.12:[12]** We say$(U,\tilde{\tau},E)$ is a soft discrete space if $\tilde{\tau}$ is the family of all soft sets that can be defined over $U$and it symbolizes by $\tilde{\tau}_{dis}$.

**Definition 1.13:[4]** A family $\delta$ of soft set is called a cover of a soft set $(F,E)$ if $(F,E)\ \tilde{\subset}\tilde{\cup}\ \{(F_i,E);\ (F_i,E)\ \tilde{\in}\ \ \delta\ ; i \in I\}$. $\delta$is said to be soft open cover if every members of $\delta$ is a soft open set.

**Definition 1.14:[4]**We say $(U,\tilde{\tau},E)$ is a soft compact if every soft open cover has a finite sub cover $(U,\tilde{\tau},E)$.

**Definition 1.15:[8]**A soft subset $(F,A)$ of soft topological space $(U,\tilde{\tau},E)$is called Soft simply-open (for short $SS^M\_open$) set if $sint\left(scl\big((F,A)\big)\right)\ \tilde{\subseteq}\ \ scl(sint\big((F,A)\big))$. It is symbolizes by $SS^M O(U)$. The complement of a soft simply open set is a soft simply closed set (for short, $SS^M\_closed$), and it symbolizes by $SS^M C(U)$.

**Definition 1.16:[13]** We say $(U,\tilde{\tau},E)$is a $soft\ lindelöf$, if every cover of $U$has a countable sub cover.

**Definition 1.17:[4]**Let$(U,\tilde{\tau},E)$be a softtopological space. A sub collection $\omega$ of $\tau$is said to be a base for $\tau$ if every member of $\tau$ can be expressed as a union of members of $\omega$.

**Proposition 1.18:[4]** Each soft compact is soft $lindelöf$ and each soft $lindelöf$ is soft paracompact.

**Definition 1.19:[12]** We say that $(U,\tilde{\tau},E)$ is a $soft\ T_2 - space$ if for any two distinct points $a\ ,b\ \ \tilde{\in}\ U$, there exist$(F,E)$ and $(G,E)\ \tilde{\in}\ \tilde{\tau}$, such that $a\ \tilde{\in}\ (F,E)$, $b\ \tilde{\in}\ (G,E)$ and $(F,E)\ \tilde{\cap}\ (G,E) = \tilde{\emptyset}$.

**Definition 1.20:[12]** We say that$(U,\tilde{\tau},E)$is a $soft\ regular\ space$ if for all $(H,E)\ \tilde{\in}\ \tilde{\tau}^{C}$ $(i.e(H,E)$ is soft closed in $U)$ and any points $a\ \tilde{\in}\ U$ such that $a\ \tilde{\notin}\ (H,E)$,then there exist$(F,E)$ and $(G,E)\ \tilde{\in}\ \tilde{\tau}$, such that [$a\ \tilde{\in}\ (F,E)$ and$(H,E)\ \tilde{\subset}\ (G,E)$ and $(F,E)\ \tilde{\cap}\ (G,E) = \tilde{\emptyset}$].

**Definition 1.21:[12]** We say that$(U,\tilde{\tau},E)$ is a$soft\ normal\ space$ if for each$(H,E)$ and $(K,E)\ \tilde{\in}\ \tilde{\tau}^{C}$ $(i.e(H,E)\ and\ (K,E)$ are soft closed in $U)$ such that $(H,E)\ \tilde{\cap}\ (K,E) = \tilde{\emptyset}$, then there exist$(F,E)$ and $(G,E)\ \tilde{\in}\ \tilde{\tau}$, such that [$(H,E)\ \tilde{\subset}\ (F,E)$, $(K,E)\ \tilde{\subset}\ (G,E)$ and $(F,E)\ \tilde{\cap}\ (G,E) = \tilde{\emptyset}$].

## 2. Soft Simply Connected Spaces:

In the section, we introduce a new concepts which is called soft simply connected spaces.

**Definition 2.1:** Let $(U,\tilde{\tau},E)$ be a soft topological space, and $(F,A)^M$,$(G,B)^M$ be twosoft simply setsover $U$ . The soft simply sets are said soft simply disjoint (for short $SS^M\_dis$) if $(F,A)^M\ \tilde{\cap}^M\ (G,B)^M = \tilde{\emptyset}$.

**Definition 2.2:**Let $(U, \tilde{\tau}, E)$ be a soft topological space, and $(F, A)^M, (G, B)^M$ be twosoftsimply setsover $U$. The soft simply sets are said soft simply separated (for short $SS^M - sep$) if $(F, A)^M \tilde{\cap}^M SS^M(cl(G\ B)^M) = \tilde{\emptyset}$ and $SS^M(cl(F, A)^M) \tilde{\cap}^M (G, B)^M = \tilde{\emptyset}$.

**Remark 2.3:** Two disjoint soft simply open sets may not be a soft simply separated, for example:

**Example 2.4 :** Consider $U$={1,2,3} and E=$\{e_1, e_2\}$, let $\tilde{\tau}$ ={$\tilde{\emptyset}$, $\tilde{U}$, ,$(F_1, E)^M$ ,$(F_2, E)^M$ ,$(F_3, E)^M$ ,$(F_4, E)^M$, $(F_5, E)^M$, $(F_6, E)^M$} are soft simply sets defined as follows:
$(F_1, E)^M$= $\{(e_1, \{2\}), (e_2, \{1\})\}$
$(F_2, E)^M$=$\{(e_1, \{3\}), (e_2, \{2\})\}$
$(F_3, E)^M$=$\{ (e_1, \{2,3\}), (e_2, \{1,2\})\}$
$(F_4, E)^M$=$\{(e_1, \{1,2\}), (e_2, \tilde{U}\}$
$(F_5, E)^M$=$\{ (e_1, \{1,2\}), (e_2, \{1,3\})\}$
$(F_6, E)^M$=$\{ (e_1, \tilde{\emptyset}), (e_2, \{2\})\}$
Then the triplet$(U, \tilde{\tau}, E)$ is a soft topological space, it is easy to see that $(F_1, E)^M \tilde{\cap}^M (F_2, E)^M = \emptyset$. Hence $SS^M(cl(F_1, E)^M)$ =$(F_6, E)^M$ and $SS^M(cl(F_1, E)^M) \tilde{\cap}^M (F_2, E)^M \neq \emptyset$.

**Definition 2.5:** Let $(U, \tilde{\tau}, E)$ be a soft topological space. If there exist two non-empty soft simply separated sets $(F, A)^M$ and $(G, B)^M$ such that $(F, A)^M \tilde{\cup}^M (G, B)^M = (U, E)^M$ , then $(F, A)^M$ and $(G, B)^M$ are said to be soft simply division(for short $SS^M - div$)for soft simply topological space $(U, \tilde{\tau}, E)$.

**Definition 2.6 :** Let $(U, \tilde{\tau}, E)$ be a soft topological space, then $(U, \tilde{\tau}, E)$ is said to be soft simply disconnected spaces if $(U, \tilde{\tau}, E)$ has a soft simply division. Otherwise $(U, \tilde{\tau}, E)$ is said to be soft simply connected spaces.

**Example 2.7 :** It is easy to see that each soft simply indiscrete space is soft simply connected and that each soft simply discrete non-trivial space is not soft simply connected.

**Theorem 2.8:**Let $(U, \tilde{\tau}, E)$ be a soft topological space. Then the following conditions are equivalent:

a) $(U, \tilde{\tau}, E)$ has a soft simply division.
b) There exist two disjoint soft simply closed sets $(F, A)^M$ and $(G, B)^M$ such that$(F, A)^M \tilde{\cup}^M (G, B)^M$=$(U, E)^M$.
c) There exist two disjoint soft simply open sets $(F, A)^M$ and $(G, B)^M$ such that$(F, A)^M \tilde{\cup}^M (G, B)^M$=$(U, E)^M$.
d) $(U, \tilde{\tau}, E)$ has a proper soft simply open and soft simply closed set in $U$.

**Proof:** (**a**) $\Longrightarrow$ (**b**)Let$(U, \tilde{\tau}, E)$ have a soft simply division$(F, E)^M$ and $(G, E)^M$. Then

$$(F, E)^M \tilde{\cap}^M (G, E)^M = \emptyset$$

and

$$SS^M(cl(F, E)^M) = SS^M(cl(F, E)^M) \tilde{\cap}^M ((F, E)^M \tilde{\cup}^M (G, E)^M)$$

$$= (SS^M(cl(F, E)^M) \tilde{\cap}^M (F, E)^M) \tilde{\cup}^M (SS^M(cl(F, E)^M) \tilde{\cap}^M (G, E)^M)$$

$= (F,E)^M.$

There for $(F,E)^M$ is a soft simply closed set in $U$ . Similar , we can see that $(G,E)^M$ is also a soft simply closed set in $U$ .

(**b**) $\Longrightarrow$ (**c**) Let $(U,\tilde{\tau},E)$ have a soft simply division $(F,E)^M$ and $(G,E)^M$ such that $(F,E)^M$ *and* $(G,E)^M$ are soft simply closed. Then the soft simply complement of $(F,E)^M$ and $(G,E)^M$ are soft simply open in $U$. Then $(F,E)^{\complement^M} \tilde{\cap}^M (G,E)^{\complement^M} = \emptyset$ and $(F,E)^{\complement^M} \tilde{\cup}^M (G,E)^{\complement^M} = U.$

(**c**) $\Longrightarrow$ (**d**) Let $(U,\tilde{\tau},E)$ have a soft simply division $(F,E)^M$ and $(G,E)^M$ such that $(F,E)^M$ *and* $(G,E)^M$are soft simply open in $U$. Then $(F,E)^M$ and $(G,E)^M$ are also soft simply closed in $U$.

(**d**) $\Longrightarrow$ (**a**) Let $(U,\tilde{\tau},E)$ has a proper soft simply open and soft simply closed set $(F,E)^M$. Then $(F,E)^{\complement^M}$ and $(F,E)^M$ are non-empty soft simply closed set, $(F,E)^{\complement^M} \tilde{\cap}^M (F,E)^M = \emptyset$ and $(F,E)^{\complement^M} \tilde{\cup}^M (F,E)^M = U$. Then $(F,E)^M$ and $(F,E)^{\complement^M}$ is a soft simply division of $U$.

**Theorem 2.9 :**Let $(U,\tilde{\tau},E)$ be a soft topological space. Then the following conditions are equivalent:

a) $(U,\tilde{\tau},E)$ has a soft simply connected.
b) There exist two disjoint soft simply closed sets $(F,E)^M$ and $(G,E)^M$ such that$(F,E)^M \tilde{\cup}^M (G,E)^M$=$(U,E)^M$.
c) There exist two disjoint soft simply open sets $(F,E)^M$ and $(G,E)^M$ such that$(F,E)^M \tilde{\cup}^M (G,E)^M = (U,E)^M$.
d) $(U,\tilde{\tau},E)$ at most has two soft simply open and soft simply closed sets in $U$,that is $\emptyset$ and $(U,E)^M$.

**Remark 2.10:** By (Theorem 2.9) , the soft topological space in Example 2.20 is a $SS^M-$ *disconnected* spaces since the soft simply set $(G,E)^M$ is soft simply open set and soft simply closed set in $U$.

**Lemma 2.11:** Let $(U,\tilde{\tau},E)$ be a soft topological spaceover $U$, and $V$ be a non-empty subset of $(U,E)^M$. If $(F_1,E)^M$ and $(F_2,E)^M$ are soft simply sets in $(V,E)^M$, then $(F_1,E)^M$ and $(F_2,E)^M$ are a soft simply separation of$(U,E)^M$.

**Proof:** We have $[SS^M(cl(F_1,E)^M) \tilde{\cap}^M (V,E)^M] \tilde{\cap}^M (F_2,E)^M = SS^M(cl(F_1,E)^M \tilde{\cap}^M (F_2,E)^M$ . Similar we have $[SS^M(cl(F_2,E)^M) \tilde{\cap}^M (V,E)^M] \tilde{\cap}^M (F_1,E)^M = SS^M(cl(F_2,E)^M \tilde{\cap}^M (F_1,E)^M$. Therefor the lemma is hold.

**Lemma 2.12:** Let $(U,\tilde{\tau},E)$ be a soft topological space over $(U,E)^M$, and $V$ be a non-empty subset of $U$such that $(V,\tilde{\sigma},E)$ is soft simply connected. If $(F_1,E)^M$ and $(F_2,E)^M$ are soft simplyseparation of $(U,E)^M$ such that $(V,E)^M \tilde{\subseteq}^M (F_1,E)^M \tilde{\cup}^M (F_2,E)^M$ ,then $(V,E)^M \tilde{\subseteq}^M (F_1,E)^M$ or $(V,E)^M \tilde{\subseteq}^M (F_2,E)^M$.

**Proof:** Since $(V,E)^M \tilde{\subseteq}^M (F_1,E)^M \tilde{\cup}^M (F_2,E)^M$ ,we $\tilde{\cap}^M$ have $((V,E)^M = (V,E)^M \tilde{\cap}^M (F_1,E)^M) \tilde{\cup}^M ((V,E)^M \tilde{\cap}^M (F_2,E)^M)$ .By (Lemma 2.11)

$(V,E)^M \widetilde{\cap}^M (F_1,E)^M$ and $(V,E)^M \widetilde{\cap}^M (F_2,E)^M$ are a soft simply separation of $(V,E)^M$. Since $(V,\tilde{\sigma},E)$ is soft simply connected, we have $(V,E)^M \widetilde{\cap}^M (F_1,E)^M = \emptyset$ or $(V,E)^M \widetilde{\cap}^M (F_2,E)^M = \emptyset$. There for,$(V,E)^M \widetilde{\subseteq}^M (F_1,E)^M$ or $(V,E)^M \widetilde{\subseteq}^M (F_2,E)^M$.

**Definition 2.13 :** Let$(U,\tilde{\tau},E)$ be a soft topological space**,** $(F,E)^M$ be soft simply subset of $U$and $e_x^M \widetilde{\in}^M U$. If every $SS^M - nbd$of$e_x^M$soft simply intersects $(F,E)^M$ in some point other than$e_x^M$itself, then $e_x^M$ is called soft simply limit point of $(F,E)^M$,( for short $SS^M - Limp$). We denoted of the set of all soft simply limit point of $(F,E)^M$by $(F,E)^{dM}$.

**Lemma 2.14:** Let $\{(U_\alpha,\ \tilde{\tau}_{U_\alpha},E)\ ; \alpha\epsilon I\}$be a family non-empty soft simply connected subspaces of soft topological space $(U,\tilde{\tau},E)$ . If $\widetilde{\cap}^M_{\alpha\epsilon I} (U_\alpha,E)^M \neq \emptyset$ , then $(\widetilde{\cup}^M_{\alpha\epsilon I} U_\alpha,\ \tilde{\tau}_{\widetilde{\cup}^M_{\alpha\epsilon I} U_\alpha},\ E)$ is a soft simply connectedsubspace of $(U,\tilde{\tau},E)$.

**Proof:** Let $S = \widetilde{\cup}^M_{\alpha\epsilon I} U_\alpha$. Choose a soft simply point $e_x^M \in (S,E)^M$. Let $(W,E)^M$ and $(Z,E)^M$ be a soft simply division of $\left(\widetilde{\cup}^M_{\alpha\epsilon I} U_\alpha, \tilde{\tau}_{\widetilde{\cup}^M_{\alpha\epsilon I} U_\alpha},\ E\right)$, then $e_x^M \in (W,E)^M$ or $e_x^M \in (Z,E)^M$. Without loss of generality, we may assume that $e_x^M \in (W,E)^M$, for each $\alpha\epsilon I$, since $\left(U_\alpha, \tilde{\tau}_{U_\alpha},E\right)$ is a soft simply connected it follows from (Lemma 2.12) that $(U_\alpha,E)^M \widetilde{\subseteq}^M (W,E)^M$ or $(U_\alpha,E)^M \widetilde{\subseteq}^M (Z,E)^M$. Therefore, we have $(V,E)^M \widetilde{\subseteq}^M (W,E)^M$ since $e_x^M \in (W,E)^M$, and then $(Z,E)^M = \emptyset$, which is a contradiction. Therefor $\left(\widetilde{\cup}^M_{\alpha\epsilon I} U_\alpha,\ \tilde{\tau}_{\widetilde{\cup}^M_{\alpha\epsilon I} U_\alpha},\ E\right)$ is a soft simply connected subspace of $(U,\tilde{\tau},E)$.

**Theorem 2.15:** Let $\{(U_\alpha, \tilde{\tau}_{U_\alpha},E)\ ; \alpha\epsilon I\}$ be a family non-empty soft simply connected subspaces of soft simply topological space $(U,\tilde{\tau},E)$. If $U_\alpha \widetilde{\cap}^M U_\beta \neq \emptyset$ for arbitrary $\alpha, \beta \widetilde{\in}^M I$, then $(\widetilde{\cup}^M_{\alpha\epsilon I} U_\alpha$, $\tilde{\tau}_{\widetilde{\cup}^M_{\alpha\epsilon I} U_\alpha},\ E)$ is a soft simply connected subspace of $(U,\tilde{\tau},E)$.

**Proof:** Fix an $\alpha_0 \in I$. For arbitrary $\beta \in I$, put $S_\beta = U_{\alpha_0} \widetilde{\cup}^M U_\beta$,(by Lemma 2.14) each $(S_\beta, \tilde{\tau}_{S_\beta},E)$ is soft simply connected. Then $\left\{(S_\beta, \tilde{\tau}_{S_\beta}, E)\ ; \beta\epsilon I\right\}$ is a family non-empty soft simply connected subspaces of softtopological space $(U,\tilde{\tau},E)$, and $\widetilde{\cap}^M_{\beta\epsilon I} S_\beta = \left(U_{\alpha_0},E\right)^M \neq \emptyset$. Obvious, we have $\widetilde{\cup}^M_{\alpha\epsilon I} U_\alpha = \widetilde{\cup}^M_{\beta\epsilon I} S_\beta$. It follows from (Lemma 2.14) that $(\widetilde{\cup}^M_{\alpha\epsilon I} U_\alpha,\ \tilde{\tau}_{\widetilde{\cup}^M_{\alpha\epsilon I} U_\alpha},\ E)$ is a soft simply connected subspaceof$(U,\tilde{\tau},E)$.

**Theorem 2.16 :**Let $(U,\tilde{\tau},E)$ be a soft topological spaceover $X$and $(V,\tilde{\sigma},E)$ is soft simply connected subspace of $(U,\tilde{\tau},E)$. If $(V,E)^M \widetilde{\subseteq}^M (A,E)^M \widetilde{\subseteq}^M SS^M(cl(Y,E)^M)$, then $(A,\tilde{\tau}_A,E)$ is asoft simply connectedsubspace of $(U,\tilde{\tau},E)$. In particular $SS^M(cl(Y,E)^M)$ isa soft simply connected subspace of$(U,\tilde{\tau},E)$.

**Proof :** Let $(W,E)^M$ and $(Z,E)^M$ be a soft simply division of $(A,\tilde{\tau}_A,E)$.By (Lemma 2.12) we have $(A,E)^M \widetilde{\subseteq}^M (W,E)^M$ or $(A,E)^M \widetilde{\subseteq}^M (Z,E)^M$. Without loss of generality, we may assume that$(A,E)^M \widetilde{\subseteq}^M (Z,E)^M$. By (Lemma 2.11) we have$SS^M(cl(W,E)^M) \widetilde{\cap}^M (Z,E)^M = \emptyset$, and hence $(A,E)^M \widetilde{\subseteq}^M (Z,E)^M = \emptyset$, which is a contradiction.

**Definition 2.17 :** Let$(U,\tilde{\tau},E)$ and $(V,\tilde{\sigma},\grave{E})$ be two soft topological spaces, let $u: U \to V$ and $p: E \to \grave{E}$be a mapping, let $f_{pu}: (U,E)^M \to (V,\grave{E})^M$ be a function and $e_F^M \in (\widetilde{U},E)^M$

a) $f_{pu}$ is soft simply $pu$ −continuous (for short $SS^M pu - cont$) at $e_F^M \in (\widetilde{U}, E)^M$, if for all $(A, \grave{E})^M \in \widetilde{N}_{\tilde{\sigma}^M}^M(f_{pu}(e_F^M))$, there exists a $(B, E)^M \in \widetilde{N}_{\tilde{\tau}^M}^M(e_F^M)$ such that $f_{pu}(B, E)^M \tilde{\subseteq}^M (A, \grave{E})^M$.
b) $f_{pu}$ is $SS^M pu - cont$ on $(\widetilde{U}, E)^M$, if $f_{pu}$ is $SS^M pu - cont$ at each soft simply point in $(\widetilde{U}, E)^M$.

**Theorem 2.18 :** The image of soft simply connected spaces under a soft simply continuous map are soft simply connected.

**Proof: :** Let $(U, \tilde{\tau}, E)$ and $(V, \tilde{\sigma}, \grave{E})$ be two soft topological spaces, where $(U, \tilde{\tau}, E)$ is soft simply connected and $f$ be a $SS^M pu - cont$ function from $(U, \tilde{\tau}, E)$ to $(V, \tilde{\sigma}, \grave{E})$, the restricted function is soft simply continuous, and without loss of generality, we may assume that $u(U) = u(V)$ $and$ $p(E) = \grave{E}$. Suppose that $(V, \tilde{\sigma}, \grave{E})$ is soft simply disconnected. By (Theorem2.9), there exists a proper soft simply open and soft simply closed set $(A, E)^M$ in $V$. Since $f$ soft simply continuous function then $f^{-1}(A, E)^M$ is a proper soft simply open and soft simply closed set in $U$ by (Theorem 6.3 in [15]), which is a contradiction.

**Proposition 2.19: [11]** Let $(U, \tilde{\tau}, E)$ be a soft topological space, then the collection $\tau_\alpha = \{F(\alpha): (F, E)^M \in \tilde{\tau}\}$ for each $\alpha \in E$, define a topology on $U$.

**Remark 2.20:** There exists soft simply connected soft topological space $(U, \tilde{\tau}, E)$ such that $(U, \tilde{\tau}_\alpha, E)$ is a soft simply disconnected softtopological space for some $\alpha \in E$.

**Example 2.21:** Consider $U$={1,2,3} and E=$\{e_1, e_2\}$, let $\tilde{\tau}$=$\{\widetilde{\emptyset}, \widetilde{U}$, ,$(F_1, E)^M$ , $(F_2, E)^M$,$(F_3, E)^M (F_4, E)^M$, $(F_5, E)^M$, $(F_6, E)^M$, $(F_7, E)^M\}$ are soft simply sets defined as follows:
$(F_1, E)^M = \{(e_1, \{1,2\}), (e_2, \widetilde{U})\}$
$(F_2, E)^M = \{(e_1, \{1,3\}), (e_2, \widetilde{U})\}$
$(F_3, E)^M = \{ (e_1, \{1\}), (e_2, \widetilde{U})\}$
$(F_4, E)^M = \{(e_1, \{2,3\}), (e_2, \widetilde{U}\}$
$(F_5, E)^M = \{ (e_1, \{1,2\}), (e_2, \{1,3\})\}$
$(F_6, E)^M = \{ (e_1, \{3\}), (e_2, \widetilde{U})\}$
$(F_7, E)^M = \{ (e_1, \widetilde{\emptyset} ), (e_2, \widetilde{U})\}$
Then $\tilde{\tau}$ is defines a soft topological on $\widetilde{U}$ and hence $(U, \tilde{\tau}, E)$ is a soft topological spaces over $\widetilde{U}$. Then $(U, \tilde{\tau}, E)$ is a soft simply connected spaces, however $(U, \tilde{\tau}_1, E)$ is soft simplydiscrete spaces, then $(U, \tilde{\tau}_1, E)$ is soft simply disconnected.

**Definition 2.22 :** Let $(U, \tilde{\tau}, E)$ be a soft topological spaces. A sub collection $\widetilde{\omega}^M$ of $\tilde{\tau}$ is said to be soft simply base for $\tilde{\tau}$ if every member of $\tilde{\tau}$ can be expressed as a soft simply union of members of $\widetilde{\omega}^M$.

**Definition 2.23:** Let $\{(U^\alpha, \tilde{\tau}_\alpha, , E_\alpha)\}_{\alpha \in I}$ be a family of soft topological spaces. Let us take as a basis for soft topology on the product spaces $(\prod_{\alpha \in I} U^\alpha, \prod_{\alpha \in I} \tilde{\tau}_\alpha, \prod_{\alpha \in I} E_\alpha)$ the collection of all soft simply sets $\{(\prod_{\alpha \in I} F_\alpha^M, \prod_{\alpha \in I} E_\alpha^M)$; there is a finite set $k \subset I$ such that $(F_\alpha, E_\alpha)^M = (U^\alpha, E_\alpha)^M$ for each $\alpha \in I \backslash k\}$.

**Theorem 2.24:** A finite product of soft simply connected spaces is soft simply connected.

**Proof :**We prove the theorem first for the product of two soft simply connected spaces $(U,\tilde{\tau},E)$ and $(V,\tilde{\sigma},\grave{E})$ choose a fix point $x\times y\in U\times V$. Obvious, $(U\times y,\tilde{\tau}\times\tilde{\sigma}|_{U\times y},E\times\grave{E})$ is a soft simply connected. For each $u\in U,(u\times V,\tilde{\tau}\times\tilde{\sigma}|_{u\times V},E\times\grave{E})$ is also soft simply connected, and put $H_u=(U\times y)\,\tilde{\cup}^M\,(u\times V)$, then each $(H_u,\tilde{\tau}\times\tilde{\sigma}|_{H_u},E\times\grave{E})$ is a soft simply connected (Lemma 2.14). Since $x\times y\in H_u;\forall u\in U,$ it follows from (Theorem 2.15) that $(\tilde{\cup}^M_{u\in U}H_u,\tilde{\tau}\times\tilde{\sigma}|_{\tilde{\cup}^M_{u\in U}H_u},E\times\grave{E})$ is a soft simply connected. The proof for any finite product of soft simply connected spaces follows by induction, using the fact that $(\prod_{i=1}^n U_i,\ \prod_{i=1}^n\tilde{\tau}_i\ ,\prod_{i=1}^n E_i)$ is soft simply homeomorphic with $\left(\prod_{i=1}^{n-1}U_i\right)\times U_n,(\prod_{i=1}^{n-1}U_i\,(\tilde{\tau}_i)\times\tilde{\tau}_n,(\prod_{i=1}^{n-1}A_i\right)\times A_n)$.

**Definition 2.25 :** Let$(U,\tilde{\tau},E)$be a softtopological spaces, define an equivalence relation on $U$ by setting $e_x^M\sim e_y^M$ if there exists a soft simply connected subspace of $(U,\tilde{\tau},E)$ containing both soft simply points $e_x^M$ *and* $e_y^M$. The equivalence classes are called the soft simply components of $U$(for short $SS^M-$ *component*) or (the soft simply connected components) of$U$. Reflexivity and symmetry of the relation are obvious. Transitivity follows by noting if $A_E$ is a soft simply connected subspaces containing soft simply points $e_x^M$ *and* $e_y^M$, and if $B_E$ is a soft simply connected subspaces containing soft simply points $e_y^M$ *and* $e_z^M$, then $A_E\,\tilde{\cup}^M\,B_E$ is a subspace containing soft simply points $e_x^M$ *and* $e_z^M$, that is soft simply connected because $A_E$ *and* $B_E$have the soft simply point$e_y^M$ in common.

**Theorem 2.26**: The soft simply components of soft topological space $(U,\tilde{\tau},E)$ are soft simply connected disjoint soft simply subspace of $U$ whose union is $U$ such that each non-empty soft simply connected subspace of$U$intersects only one of them.

**Proof:** Being equivalence classes, the soft simply components of $U$are disjoint and their union is $U$. Let $A_E$ be an arbitrary soft simply connected subspace. Then $A_E$intersects only one of them. For if $A_E$ intersects the soft simply components $G_E$ and $D_E$ of $U$, say in soft simply points$e_x^M$ *and* $e_y^M$, respectively, then by definition, this cannot happen unless $G_E=D_E$. Next we shall show the soft simply component $G_E$is soft simply connected. Choose a soft simply point $e_z^M$of $G_E$. For each soft simply point $e_x^M$ of $G_E$, we know that $e_z^M\sim e_x^M$, hence there exists a soft simply connected subspace$L_E^{e_x^M}$ containing$e_z^M$ and $e_x^M$. Obvious, each $L_E^{e_x^M}\ \tilde{\subseteq}^M\ G_E$.Therefore, $G_E=\tilde{\cup}^M_{e_x\epsilon G_E}L_E^{e_x^M}$. Since the soft simply subspace$L_E^{e_x^M}$ are soft simply connected and have the soft simply point$e_z^M$ in common, $G_E$is soft simply connected by Theorem 2.15.

## 3.SOFT SIMPLY PARACOMPACT SPACES:

In this section, we introduce a new concepts which is called soft simply paracompact spaces.

**Definition 3.1:** Let $(U,\tilde{\tau},E)$be a soft topological space and $\eta$ be a collection of soft simply sets of $(U,E)^M$, then :

1. $\eta$ is said to be soft simply locally finite in $(U,E)^M$ (for short $SS^M-$locally finite ), if each soft simply point of $(U,E)^M$ has a$SS^M-nbd$ that intersects only finitely many elements of $\eta$.

2. A collection $\sigma$ of soft simply sets of $(U,E)^M$, is said to be a soft simply refinement(for short $SS^M - ref$)of $\eta$ if for each element $B \in \sigma$, there exists an element$A \in \eta$ containing $B$, if the elements of $\sigma$are soft simply open sets, we call $\sigma$ a soft simply open refinement of $\eta$, if they are soft simply closed, we call $\sigma$ a soft simply closed refinement.

**Proposition 3.2:** Let $\eta$ be a soft simply locally finite collection of soft subsetsof $(U,E)^M$. Then:

1) Any subcollection of $\eta$ is soft simply locally finite .

2) The collection $\sigma = \{(SS^M(cl(F,E)^M) : (F,E)^M \in \eta\}$is soft simply locally finite .

3)$SS^M(cl(\tilde{\cup}^M{}_{(F,E)^M \in \eta}\,(F,E)^M)) = \tilde{\cup}^M{}_{(F,E)^M \in \eta}\, SS^M(cl(F,E)^M)$ .

**Proof: (1)** Is trivial by definition of soft simply locally finite.

**(2)**Note that any soft simply open set $(A,E)^M$ that intersects the soft simply set $SS^M(cl(F,E)^M)$ necessarily intersects$(F,E)^M$. Thus if $(A,E)^M$is a $SS^M - nbd$of$SS^M - point\ e_x^M$that intersects only finitely many elements $(F,E)^M$of $\eta$, then $(F,E)^M$ can intersect at must the same number of soft simply sets of the collection $\sigma$.

**(3)** Let$\tilde{\cup}^M_{(F,E)^M \in \eta}\,(F,E)^M = (Y,E)^M$ . Obvious $\tilde{\cup}^M_{(F,E)^M \in \eta}\, SS^M(cl(F,E)^M) = SS^M(cl(Y,E)^M)$. We prove the reverse inclusion under the assumption of soft simply locally finiteness. Let $e_x^M \in SS^M(cl(Y,E)^M)$, let $(A,E)^M$is a $SS^M - nbd$of $SS^M - pointe_x^M$that intersects only finitely many elements $(F,E)^M$of $\eta$, say $(F_1,E)^M, \ldots, (F_k,E)^M$. Then $e_x^M$belongs to one of the soft simply sets $SS^M(cl(F_1,E)^M, \ldots, SS^M(cl(F_k,E)^M$. For otherwise, the soft simply set $(A,E)^M \tilde{\cap}^M (\tilde{\cup}^M \{SS^M(cl(F_1,E)^M, \ldots, SS^M(cl(F_k,E)^M\})^C$ would be a $SS^M - nbd$ of $e_x^M$ that intersects no element of $\eta$, and therefore it does not intersect $(Y,E)^M$, which is a contradiction with $e_x^M \in SS^M(cl(Y,E)^M$.

**Definition 3.3:** Let $(U,\tilde{\tau},E)$be a soft topologicalspace is said to be soft simply paracompact (for short $SS^M - paracompact$ ) if each soft simply open covering $\eta$ of $(U,E)^M$ has a soft simply locally finite soft simply open refinement$\sigma$ that covers $(U,E)^M$.

**Remark 3.4 :** Any $SS^M - compact$ is $SS^M - lindelöf$ , and any $SS^M - lindelöf$ is $SS^M - paracompact$.

**Proposition 3.5 :**Let $(U,\tilde{\tau},E)$be a$SS^M - paracompact$space**.** If$E = \{e\}$, then $(U,\tilde{\tau},E)$ is $SS^M - paracompact$ if and only if the collection $\eta = \{F(e) : (F,E)^M \in \tilde{\tau}\}$ is a $SS^M - paracompact$ topology on $U$.

It is well known that a $lindelöf$ spacemay not compact and a paracompact space may not $lindelöf$. Therefore, it follows from Proposition 3.5 that a $SS^M - lindelöf$ space may not $SS^M - compact$and a $SS^M - paracompact$ space may not $SS^M - lindelöf$.

**Theorem 3.6 :**Each$SS^M - paracompact$and $SS^M - T_2\ space$ is $SS^M - normal\ space$.

**Proof**: Let $(U,\tilde{\tau},E)$ be a $SS^M-paracompact$ and $SS^M-\mathrm{T}_2\ space$. First one proves soft simply regularity. Let $e_x^M$ be a $SS^M-Limp$ of $(U,E)^M$ and let $(A,E)^M$ be a $SS^M-closed$set of$(U,E)^M$ disjoint from $e_x^M$. The $SS^M-\mathrm{T}_2$condition enable us to take,$\forall SS^M-Limpe_y^M$ in $(A,E)^M$ an $SS^M-open$ set $\left(B^{e_y^M},E\right)^M$ about $e_y^M$ whose$SS^M-closure$ is disjoint from$e_x^M$. Let $\eta=\{\left(B^{e_y^M},E\right)^M: e_y^M\in(A,E)^M\}\ \tilde{\cup}^M\ \{(A,E)^{M^{\complement}}\}$. Then $\eta$ is a $SS^M-open$covering of $(U,E)^M$. Since $(U,\tilde{\tau},E)$ is a $SS^M-paracompact$ there exists a $SS^M-locally\ finiteSS^M-\ open$ refinement $\sigma$ that covers $(U,E)^M$. Form the subcollection $\mu$ of $\sigma$ consisting of each element of $\sigma$ that intersects $(A,E)^M$. Then $\mu$ covers $(A,E)^M$. Moreover, if $C\in\mu$, then the $SS^M-closure$ of $C$ is disjoint from $e_x^M$ Since $C$ interects $(A,E)^M$ it lies in some $SS^M-open$ set $\left(B^{e_y^M},E\right)^M$, whose $SS^M-closure$ is disjoint from$e_x^M$. Let $(V,E)^M=\tilde{\cup}_{C\in\mu}^M C,(V,E)^M$ is a $SS^M-open$ in $(U,E)^M$ containing $(A,E)^M$. Since $\mu$ is $SS^M-locally\,finite$ ,$SS^M(cl(V,E)^M)=\tilde{\cup}_{C\in\mu}^M SS^M(cl(C))$by (Proposition 3.2). Then $SS^M(cl(V,E)^M)$ is disjoint from$e_x^M$. Thus soft simply regularity is proved .

To prove soft simply normality, one only repeats the same argument, replacing $e_x^M$by a $SS^M-closed$ set throughout and replacing the $SS^M-\mathrm{T}_2$condition bysoft simply regularity.

**Theorem 3.7 :** Each$SS^M-closed$ subspace of a $SS^M-paracompact$ is$SS^M-paracompact$.

**Proof:**Let $(U,\tilde{\tau},E)$be a $SS^M-paracompact$ space, and $Y\ \tilde{\subseteq}^M\ U$ such that $(Y,E)^M$ is $SS^M-closed$ in $(U,E)^M$, let η be a soft simply covering of $(Y,E)^M$ by $SS^M-open$ in $(Y,E)^M$. For every $(A,E)^M\in\eta$, take $SS^M-open$ set $\left(\grave{A},E\right)^M$ of $(U,E)^M$ such that $\left(\grave{A},E\right)^M\ \tilde{\cap}^M\ (Y,E)^M=(A,E)^M$. Cover $(U,E)^M$ by the $SS^M-open\left(\grave{A},E\right)^M$,along with the $SS^M-open$ set $(Y,E)^{M^{\complement}}$. Suppose that $\sigma$ is a $SS^M-locally\,finiteSS^M-open$ refinement of this $SS^M-covering$ that covers $(U,E)^M$. Then the collection $\mu=\{(B,E)^M\ \tilde{\cap}^M\ (Y,E)^M:(B,E)^M\in\sigma\}$ is the required locally finite soft simply open refinement of η.

**Remark 3.8 :** By Proposition 3.5 , it is easy to see the following two facts:

1) A $SS^M-paracompact$ sub space of a$SS^M-\mathrm{T}_2\ space(U,\tilde{\tau},E)$ need do not be $SS^M-closed$ in $(U,E)^M$.
2) A $SS^M-subspace$ of a $SS^M-paracompact$ need not by$SS^M-paracompact$.

**Lemma 3.9:**Let $(U,\tilde{\tau},E)$be a softtopological space.If each $SS^M-open$ covering of $(U,\tilde{\tau},E)$ has a $SS^M-$locally finite $SS^M-closed$ refinement, then every $SS^M-open$ covering of $(U,\tilde{\tau},E)$ has $SS^M-$locally finite$SS^M-open$refinement.

**Proof:** Let η be a $SS^M-open$ covering of $(U,\tilde{\tau},E)$, and let $\sigma=\{(F_s,E)^M:s\in S\}$,be a $SS^M-$locally finite $SS^M-closed$ refinement of η. For each $SS^M-pointe_x^M\in(U,E)^M$, choose a $SS^M-open\,nbh\left(V_{e_x^M},E\right)^M$ of $e_x^M$ such that $\left(V_{e_x^M},E\right)^M$ intersect finitely many elements of $\sigma$ .Let $\mu=\left\{\left(V_{e_x^M},E\right)^M: e_x^M\in\ (E,E)^M\right\}$, and let $\mathcal{D}$ be a $SS^M-$locally finite$SS^M-closed$ refinement of$\mu$. For each$s\in S$,put $(W_s,E)^M=(\tilde{\cup}^M\{(D,E)^M:(D,E)^M\in\ \mathcal{D},(D,E)^M\ \tilde{\cap}^M\ (F_s,E)^M=\emptyset\})^{\complement}$. Obvious, each $(W_s,E)^M$ is $SS^M-open$ and contains$(F_s,E)^M$. Moreover, for each $s\in S$ and each $(D,E)^M\in\mathcal{D}$ , we have $(W_s,E)^M \tilde{\cap}^M (D,E)^M \neq \emptyset$ if and only if $(F_s,E)^M \tilde{\cap}^M (D,E)^M \neq \emptyset$. For each $s \in S$, choose a $(A_s,E)^M \in$ η such that $(F_s,E)^M \tilde{\subset}^M (A_s,E)^M$ , and let $(G_s,E)^M = (A_s,E)^M \tilde{\cap}^M (W_s,E)^M$ . Then $\{(G_s,E)^M: s \in S\}$ is a $SS^M - open$ covering and refines η. It is easy to see that each element of $\mathcal{D}$ intersects only finitely many $(G_s,E)^M$. Therefore $\{(G_s,E)^M: s \in S\}$ is a $SS^M$ −locally finite.

**Lemma 3.10 :**Each $\sigma$ −locally finite soft simply open covering has a soft simply locally finite refinement.

**Proof :**Let $\mathcal{U} = \tilde{\cup}^M_{n\in N} \mathcal{U}_n$ be a $\sigma$ −locally finite soft simply open covering for some soft topological space, where each $\mathcal{U}_n$ is $SS^M$ − locally finite. Put $\mathcal{V}_1 = \mathcal{U}_1$ , $\mathcal{V}_n = \{(F,E)^M \tilde{\cap}^M (\tilde{\cup}^M_{k<n} \mathcal{U}^*_k)^C : (F,E)^M \in \mathcal{U}_n \}$, where $\mathcal{U}^*_k = \tilde{\cup}^M \{(F,E)^M: (F,E)^M \in \mathcal{U}_k\}$. Then it is easy to see that $\mathcal{V} = \tilde{\cup}^M_{n\in N} \mathcal{V}_n$ is a $SS^M$ −locally finite soft simply open covering and refines $\mathcal{U}$.

**Lemma 3.11 :** Let $(U,\tilde{\tau},E)$ be a $SS^M - regular$, if each soft simply open covering of $(U,\tilde{\tau},E)$ has a $SS^M$ −locally finite refinement, then it has a $SS^M$ −locally finite $SS^M$ −closed refinement.

**Proof:** Let $\mathcal{U} = \{(F_\alpha,E)^M ;\ \alpha \in A\}$ be an arbitrary soft simply open covering. Then, for each $SS^M - Limtpe^M_x \in U$, there exists some $(F_\alpha,E)^M \in U$ such that $e^M_x \in (F_\alpha,E)^M$. By soft simply regularity, there is an $SS^M - nbh(\mathcal{V}_{e^M_x},E)$ such that $e^M_x \in (\mathcal{V}_{e^M_x},E) \tilde{\subseteq}^M SS^M(cl(\mathcal{V}_{e^M_x},E)^M \tilde{\subseteq}^M (F_\alpha,E)^M$ . Put $\mathcal{V} = \{(\mathcal{V}_{e^M_x},E);\ e^M_x \in U\}$. Then $\mathcal{V}$ is a soft simply open covering and refines $\mathcal{U}$. By the assumption, there is a $SS^M$ −locally finite soft simply covering $\mathcal{W} = \{(\mathcal{W}_\beta,E)^M;\ \beta \in B\}$, such that $\mathcal{W}$ refines $\mathcal{V}$. Then $\{SS^M(cl(\mathcal{W}_\beta,E)^M);\ \beta \in B\}$ is a $SS^M$ −locally finite soft simply closed covering and refines $U$.

By Lemma 3.9, 3.10, and 3.11, we have the following theorem:

**Theorem 3.12:**Let $(U,\tilde{\tau},E)$ be a $SS^M - regular$**.** Then the following conditions on $U$ are equivalent:

1) $(U,\tilde{\tau},E)$ is a $SS^M - paracompact$.
2) Every soft simply open covering has a $\sigma$ −locally finite soft simply open refinement.
3) Every soft simply open covering has a locally finite soft simply refinement.
4) Every soft simply open covering has a locally finite soft simply closed refinement.

**Conclusion:**

The aim of this research is using the class of soft simply open set to define soft simply connected spaces. we study basic definitions and theorems about it. Further, we introduce the notion Soft Simply Paracompact Spaces, and we present soft simply pu-continuous defined between two soft topological spaces and study their properties in detail. Finally, we hope is togeneralize these notions by using other open sets.

**References:**

[1] Molodtsov, D.1999. Soft set theory—first results". *Computers and Mathematics with Applications*, *37*(4-5), 19-31.

[2] Maji P, K and Biswas ,R and Roy, A. 2003. Soft set theory. *Computers and Mathematics with Applications*, *45*(4-5), 555-562.

[3] Shabir, M. and Naz, M. 2011. On Some New Operations in Soft Set Theory. *Computers andMath.withAppl*, *57*, 1786-1799.

[4] Aygünoğlu, A and Aygün, H. 2011. Some notes on soft topological spaces. *Neural computing and Applications*, *21*(1), 113-119.

[5] Min W. K. 2011.A note on soft topological spaces. *Computers and Mathematics with Applications*, *62*(9), 3524-3528.

[6] Neubrunnová , A 1975. On transfinite sequences of certain types of functions. *Acta Fac. Rer .Natur. Univ. Comenianae, 30*, 121-126.

[7] Willard, S. 1970. *General topology*. Addison Readings Mass. London D, on Mills. Ont.

[8] El. Sayed, M andNoaman, I, A. 2013. simply fuzzy generalized open and closed sets . *Journal of Advances in Mathematics* 4(3), 528-533.

[9] El. Sayed , M and El-Bably, M. K.2017. Soft Simply Open Sets in Soft Topological Space. *Journal of Computational and Theoretical Nanoscience*, *14*(8), 4100-4103.

[10]Subhashinin, J and Sekar, C. 2014. Soft P-connectedness via soft P-open sets, *International Journal of Mathematics Trends and Technology*. 6(3) 203-214.

[11] Chen, B. 2013. Some local properties of soft semi-open sets, *Discrete Dynamics in Nature and Society, 2013*.

[12] Shabir, M. and Naz, M. 2011. On soft topological spaces. *Computers and Mathematics with Applications, 61(7): 1786-1799*.

[13] Rong ,W.2012. The countabilities of soft topological spaces. *International Journal of Computational and Mathematical Sciences*, *6*, 159-162.

[14] Zorlutuna, I., Akdag, M., Min, W. K., &Atmaca, S. (2012). Remarks on soft topological spaces. *Annals of fuzzy Mathematics and Informatics*, *3*(2), 171-185.

[15] Lin, F. (2013). Soft connected spaces and soft paracompact spaces. *International Journal of Mathematical and Computational Sciences*, *7*(2), 277-283.

[16] Hussain, S. (2015). A note on soft connectedness. *Journal of the Egyptian Mathematical Society*, *23*(1), 6-11.

[17] Fischer, H., Repovš, D., Virk, Ž., &Zastrow, A. (2011). On semilocally simply connected spaces. *Topology and its Applications*, *158*(3), 397-408.

[18] Krishnaveni, J., &Sekar, C. (2013). Soft semi connected and Soft locally semi connected properties in Soft topological spaces. *International Journal of Mathematics and Soft Computing*, *3*(3), 85-91.

[19] Al-Khafaj, M. A. K., &Mahmood, M. H. (2014). Some properties of soft connected spaces and soft locally connected spaces. *IOSR Journal of Mathematics*, *10*(5), 102-107.

[20] El-Latif, A. M. A. (2016). Soft connected properties and irresolute soft functions based on b-open soft sets. *FactaUniversitatis, Series: Mathematics and Informatics*, *31*(5), 947-967.

[21] Lin, F. (2013). Soft connected spaces and soft paracompact spaces. *International Journal of Mathematical and Computational Sciences*, *7*(2), 277-283.