Application of Intuitionistic Fuzzy Soft Set to Topology

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Abstract. A new topology on a set can be generated by a basis. In this paper, we construct an intuitionistic fuzzy soft basis for an intuitionistic fuzzy soft topology. Furthermore, we define the intuitionistic fuzzy soft topology generated by basis and establish some important theorem. Also, some concepts of intuitionistic fuzzy soft basis and subbasis are introduced here.

1. Introduction

A set is one of the basic concepts in mathematics. A crisp set is a set with fixed and well-defined boundary. A more general concept of the crisp set is a fuzzy set. The concept of a fuzzy set was introduced by Prof. L.A. Zadeh in 1965 as a potential tool for handling imprecision and uncertainties, for examples like beautiful women, delicious food, etc.

A more general concept of the fuzzy set is an intuitionistic fuzzy set that was introduced by Atanassov in 1980. In addition to the degree of membership there is also a degree of non-membership in this set. In 1990, D. Molodtsov introduced a new concept about soft set theory. Then, in 2001, Maji and friends were developed the theory of intuitionistic fuzzy soft set by combining the intuitionistic fuzzy set theory and soft set theory. There are some theories related to intuitionistic fuzzy soft set such as intuitionistic fuzzy soft topology, intuitionistic fuzzy soft basis, intuitionistic fuzzy soft subbasis, and intuitionistic fuzzy soft topology generated by basis.

In this paper, we try to redefine some definitions on intuitionistic fuzzy soft set in another form. Then we define an intuitionistic fuzzy soft basis, intuitionistic fuzzy soft subbasis, and also here we established some important theorems related to this topic.

2. Preliminaries

Let $U$ be an initial universe set and $E$ is the set of parameters. Let $P^U$ denote the power set of $U$.

**Definition 2.1** ([6]). A fuzzy set $L$ in $U$ is defined by:

$$L = \{(x, \mu_L(x)) \mid x \in U\}$$

where $\mu_L : U \to [0,1]$ is membership function and $\mu_L(x)$ represents the degree of membership of $x \in U$. The collection of all fuzzy sets on $U$ is denoted by $P^U$.

In general, for each $x \in A$, $l(x)$ is a fuzzy set of $U$, and can denote the membership function of $l(x)$ by $l_x : U \to [0,1]$.

**Definition 2.2** ([1]). An intuitionistic fuzzy set $F$ in $U$ is defined by

$$F = \{(x, \mu_F(x), \nu_F(x)) \mid x \in U\}$$

where

$\mu_L : U \to [0,1]$ represents the degree of membership and $\nu_L : U \to [0,1]$ represents the degree of non-membership.

$\mu_F : U \to [0,1]$ represents the degree of belongingness and $\nu_F : U \to [0,1]$ represents the degree of non-belongingness.
with the condition
\[ 0 \leq \mu_F(x) + \nu_F(x) \leq 1, \quad \forall x \in U. \]

The number \( \mu_F(x) \) and \( \nu_F(x) \) symbolized respectively the degree of membership and non-membership of the element \( x \in U \) to \( F \). The family of all intuitionistic fuzzy sets on \( U \) is denoted by \( IF^U \).

**Definition 2.3** ([1]). Let \( F, G \in IF^U \), with
\[ F = \{(x, \mu_F(x), \nu_F(x)) \mid x \in U\} \]
and
\[ G = \{(x, \mu_G(x), \nu_G(x)) \mid x \in U\} \]
then
1. \( F \) is said subset of \( G \) if and only if \( \mu_F(x) \leq \mu_G(x) \) and \( \nu_F(x) \geq \nu_G(x) \) for all \( x \in U \).
2. \( F \land G = \{(x, \min\{\mu_F(x), \mu_G(x)\}, \max\{\nu_F(x), \nu_G(x)\}) \mid x \in U\} \).
3. \( F \lor G = \{(x, \max\{\mu_F(x), \mu_G(x)\}, \min\{\nu_F(x), \nu_G(x)\}) \mid x \in U\} \).

**Definition 2.4** ([1]). A set \( F \) where \( F = \{(x, 0,1) \mid x \in U\} \) is said intuitionistic fuzzy empty set. We symbolized by \( \tilde{0} \).

**Definition 2.5** ([1]). A set \( F \) where \( F = \{(x, 1,0) \mid x \in U\} \) is said intuitionistic fuzzy universe set. We symbolized by \( \tilde{1} \).

**Definition 2.6** ([2]). A pair \((F,A)\) is said a soft set in \( U \) where \( F \) is a mapping given by \( F: A \to P(U) \) and \( A \subseteq E \).

Where \( P(U) \) is the power set of \( U \). Next, we will give you definition of fuzzy soft set by combining fuzzy set theory and soft set theory. Also definition of intuitionistic fuzzy soft set by combining the concept of intuitionistic fuzzy set and soft set.

**Definition 2.7** ([3]). A pair \((F,A)\) is said fuzzy soft set over \( U \), if \( F \) is a mapping given by \( F: A \to IF^U \).
We denote \((F,A)\) by \( f_A \).

**Definition 2.8** ([5]). A pair \((f,A)\) is said an intuitionistic fuzzy soft set over \( U \), where \( f \) is mapping given by \( f: A \to IF^U \). We symbolized \((f,A)\) by \( f_A \).

The collection of all intuitionistic fuzzy soft sets over \( U \) is denoted by \( IFS^U \).

**Definition 2.9** ([5]). Let \((f,A)\) and \((g,B)\) be two intuitionistic fuzzy soft sets over \( U \), and \( A, B \subseteq E \).
1. The intersection of \((f,A) \cap (g,B) = (h,C)\) where \( C = A \cap B \) and \( \forall e \in C, \ h(e) = f(e) \land g(e) \). We write \( f_A \cap g_B = h_C \).
2. The union of \((f,A) \cup (g,B) = (h,C)\) where \( C = A \cup B \) and \( \forall e \in C, \ h(e) = \begin{cases} f(e), & e \in A - B \\ g(e), & e \in B - A \\ f(e) \lor g(e), & e \in A \cap B \end{cases} \).
   We write \( f_A \cup g_B = h_C \).
3. \( f_A \) is called intuitionistic fuzzy soft subset of \( g_B \), if \( A \subseteq B \) and \( f(e) \) is intuitionistic fuzzy subset of \( g(e) \) for any \( e \in A \). We write \( f_A \subseteq g_B \).
4. \( f_A \) and \( g_B \) are called equal, if \( f_A \equiv g_B \) and \( g_B \equiv f_A \). We write \( f_A = g_B \).
Definition 2.10[5]. Let $f_E \in IFS^U$.

1. $f_E$ is said absolute intuitionistic fuzzy soft over $U$, if $f(e) = \widetilde{1}$ for any $e \in E$. We symbolized it by $I_E$.

2. $f_E$ is said null intuitionistic fuzzy soft over $U$, if $f(e) = \widetilde{0}$ for any $e \in E$. We symbolized it by $\Phi_E$.

Example 2.11. Let $U = \{x_1, x_2, x_3, x_4\}$ be a universe consisting of four gown as possible alternatives, and let $A = \{e_1, e_2, e_3\} \subseteq E$, where $e_1, e_2$ and $e_3$ represent the parameters “beautiful”, “expensive”, and “stylish”, respectively. Consider a soft set $f_A$ which describes the “attractiveness of the gowns” that Miss X is going to buy. Let $f_A$ defined as follows

$$
\begin{align*}
\Phi(E) &= \{(x_1, 0.7, 0.2), (x_2, 0.3, 0.6), (x_3, 0.4, 0.5), (x_4, 0.8, 0.2)\} \\
\Phi(e_2) &= \{(x_1, 0.7, 0.3), (x_2, 0.5, 0.3), (x_3, 0.5, 0.5), (x_4, 0.9, 0.1)\} \\
\Phi(e_3) &= \{(x_1, 0.8, 0.2), (x_2, 0.2, 0.7), (x_3, 0.6, 0.3), (x_4, 0.9, 0.1)\}.
\end{align*}
$$

Thus

$$
\begin{align*}
\Phi_A &= \{(e_1, \{(x_1, 0.7, 0.2), (x_2, 0.3, 0.6), (x_3, 0.4, 0.5), (x_4, 0.8, 0.2)\}), \\
&\{(e_2, \{(x_1, 0.7, 0.3), (x_2, 0.5, 0.3), (x_3, 0.5, 0.5), (x_4, 0.9, 0.1)\}), \\
&\{(e_3, \{(x_1, 0.8, 0.2), (x_2, 0.2, 0.7), (x_3, 0.6, 0.3), (x_4, 0.9, 0.1)\})\}.
\end{align*}
$$

3. Application of Intuitionistic Fuzzy Soft Set to Topology

Let $U$ is an initial universe set, $E$ is the set of parameters, and $IFS^U$ is a collection of all intuitionistic fuzzy soft sets of $U$.

Definition 3.1[7]. Let $IFS^U$ is the collection of all intuitionistic fuzzy soft sets over $U$, and $E$ is a parameter set. Let $\tau \subseteq IFS^U$. Then $\tau$ is said an intuitionistic fuzzy soft topology on $U$ if it satisfies the following three conditions:

1. $\Phi_E, I_E \in \tau$.
2. $f_E, g_E \in \tau$ implies $f_E \cap g_E \in \tau$.
3. $\{(f_{\alpha})_E : \alpha \in \Gamma\} \subseteq \tau$ implies $\cup\{(f_{\alpha})_E : \alpha \in \Gamma\} \in \tau$.

$\tau$ is said to be topology for an intuitionistic fuzzy soft over $U$ and $(U, E, \tau)$ is said an intuitionistic fuzzy soft topological space in $U$. Each element of $\tau$ is said an intuitionistic fuzzy soft open sets in $U$.

Example 3.2. Let $U = \{x_1, x_2\}$ and $E = \{e_1, e_2\}$. Let $f_E, g_E \in IFS^U$ where

$$
\begin{align*}
f(e_1) &= \{(x_1, 0.7, 0.2), (x_2, 0.2, 0.6)\}, \\
f(e_2) &= \{(x_1, 0.7, 0.1), (x_2, 0.5, 0.3)\}; \\
g(e_1) &= \{(x_1, 0.6, 0.2), (x_2, 0.3, 0.5)\}, \\
g(e_2) &= \{(x_1, 0.7, 0.2), (x_2, 0.4, 0.3)\};
\end{align*}
$$

and $h_E = f_E \cup g_E$, where

$$
\begin{align*}
h(e_1) &= \{(x_1, 0.7, 0.1), (x_2, 0.3, 0.5)\}, \\
h(e_2) &= \{(x_1, 0.7, 0.2), (x_2, 0.5, 0.3)\};
\end{align*}
$$

and $l_E = f_E \cap g_E$, where

$$
\begin{align*}
l(e_1) &= \{(x_1, 0.6, 0.2), (x_2, 0.2, 0.6)\}, \\
l(e_2) &= \{(x_1, 0.7, 0.2), (x_2, 0.4, 0.3)\}.
\end{align*}
$$

Thus, $\tau = \{\Phi_E, E, f_E, g_E, h_E, l_E\}$ is topology for an intuitionistic fuzzy soft set on $U$.

Definition 3.3.

1. Let $\tau$ is the collection of all intuitionistic fuzzy soft sets which can be defined in $U$. $\tau$ is said discrete topology for an intuitionistic fuzzy soft set on $U$, and $(U, E, \tau)$ is called an intuitionistic fuzzy soft discrete space over $U$. 

3
(2) $\tau = \{ \Phi_E, I_E \}$ is said the intuitionistic fuzzy soft indiscrete topology on $U$, and $(U,E,\tau)$ is called an intuitionistic fuzzy soft indiscrete space over $U$.

**Theorem 3.4.** Let $(U,E,\tau_1)$ and $(U,E,\tau_2)$ are two intuitionistic fuzzy soft topologies over $U$. Denote the intersection of $\tau_1$ and $\tau_2$ as $\tau_1 \cap \tau_2 = \{ f_E | f_E \in \tau_1, f_E \in \tau_2 \}$. Then $\tau_1 \cap \tau_2$ is also topology for it on $U$.

**Proof.** Let $\tau_1$ and $\tau_2$ be two intuitionistic fuzzy soft topology on $U$. Obviously $\Phi_E, I_E \in \tau_1 \cap \tau_2$. Let $f_E, g_E \in \tau_1 \cap \tau_2$, then $f_E, g_E \in \tau_1$ and $f_E, g_E \in \tau_2$. It is mean $f_E \cap g_E \in \tau_1$ and $f_E \cap g_E \in \tau_2$. Hence $f_E \cap g_E \in \tau_1 \cap \tau_2$. Let $\{ (f_{\alpha})_E : \alpha \in \Gamma \} \subseteq \tau_1 \cap \tau_2$, then $(f_{\alpha})_E \in \tau_1$ and $(f_{\alpha})_E \in \tau_2$ for any $\alpha \in \Gamma$. Since $\tau_1$ and $\tau_2$ are two intuitionistic fuzzy soft topologies on $U$, then $\bigcup \{ (f_{\alpha})_E : \alpha \in \Gamma \} \subseteq \tau_1 \cap \tau_2$. Therefore, $\bigcup \{ (f_{\alpha})_E : \alpha \in \Gamma \} \subseteq \tau_1 \cap \tau_2$.

**Definition 3.5.** Let $(U,E,\tau)$ is an intuitionistic fuzzy soft topological space and $\beta$ is a collection of subsets of $IFS^U$. A collection $\beta$ is called an intuitionistic fuzzy soft basis for $\tau$ on $U$ if it satisfies the three follows condition:

1. $\bigcup f_{A \in \beta} = I_E$ i.e. for every $e \in E$ and $x \in U$, there is $f_A \in \beta$ such that $f(e) = \tilde{1}$, where $\mu_{f_A}(x) = 1$ and $\nu_{f_A}(x) = 0$ for each $x \in U$.
2. If $f_A, g_B \in \beta$ with $A, B \subseteq E$ then for every $e \in E$ and $x \in U$, there is $h_C \in \beta$ such that $h_C \subseteq f_A \cap g_B$ and $\mu_{h_C}(x) \leq \min(\mu_{f_A}(x), \mu_{g_B}(x))$ and $\nu_{h_C}(x) \geq \max(\nu_{f_A}(x), \nu_{g_B}(x))$, where $C \subseteq A \cap B$.

**Example 3.6.** Let $\tau$ be the intuitionistic fuzzy soft topology in Example 3.2, Then, $\beta$ defined by $\beta = \{ \Phi_E, I_E, f_E, g_E, I_E \}$ is a basis for $\tau$. This statement will be shown using Definition 3.5. Obviously $\Phi_E \in \beta$. For every $e \in E$ and $x \in U$, there is $l_E \in \beta$ such that $\Phi_E \cup l_E \cup f_E \cup g_E \cup l_E = I_E$. Since in Example 3.2, $f_E \cap g_E = l_E$, then there exists $l_E \in \beta$ such that $l_E \subseteq f_E \cap g_E$. Thus, $\beta$ defined by $\beta = \{ \Phi_E, I_E, f_E, g_E, I_E \}$ is a basis for $\tau$.

**Example 3.7.** Let $U = \{ x_1, x_2 \}$ and $E = \{ e_1, e_2 \}$. Let $f_E, g_E \in IFS^U$ that defined by $f_E = \{(e_1, ((x_1, 1,0), (x_2, 1,0))), (e_2, ((x_1, 0,7,0,3), (x_2, 0,5,0,3)))\}$ $g_E = \{(e_1, ((x_1, 0,6,0,2), (x_2, 0,8,0,1))), (e_2, ((x_1, 1,0), (x_2, 1,0)))\}$ Then, collection $\beta$ that defined by $\beta = \{ \Phi_E, f_E, g_E \}$ is an intuitionistic fuzzy soft basis for $\tau$ on $U$. This statement will be shown using Definition 3.5. Obviously $\Phi_E \in \beta$. Look that $\Phi_E \cup f_E = f_E \neq I_E$ and $\Phi_E \cup g_E = g_E \neq I_E$, but $f_E \cup g_E = \{(e_1, ((x_1, 1,0), (x_2, 1,0))), (e_2, ((x_1, 1,0), (x_2, 1,0)))\} = l_E$. Next, $f_E \cup g_E = \{(e_1, ((x_1, 0,6,0,2), (x_2, 0,8,0,1))), (e_2, ((x_1, 0,7,0,3), (x_2, 0,5,0,3)))\}$. Then, there exist $\Phi_E \in \beta$ such that $\Phi_E \subseteq f_E \cap g_E$. Thus, collection $\beta$ that defined by $\beta = \{ \Phi_E, f_E, g_E \}$ is an intuitionistic fuzzy soft basis for $\tau$ on $U$.

If $\beta$ satisfies these three condition in Definition 3.5, then defined the intuitionistic fuzzy soft topology generated by $\beta$ is defined as follows:

**Definition 3.8.** Let $\beta$ is an intuitionistic fuzzy soft basis for $\tau$ on $U$. Suppose $\tau_\beta$ be an intuitionistic fuzzy soft topology that generated by $\beta$ is defined as follows: An intuitionistic fuzzy soft set $g_B$ is said to be an element of $\tau_\beta$ if and only if for each $e \in E$ and $x \in U$, there is an intuitionistic fuzzy soft basis element $f_A \in \beta$ such that $f_A \subseteq g_B$, where $A \subseteq B$.
**Theorem 3.9.** If $\tau_\beta$ is an intuitionistic fuzzy soft topology generated by $\beta$, then $\tau_\beta$ is an intuitionistic fuzzy soft topology on $U$.

**Proof.** Let $\tau_\beta$ is an intuitionistic fuzzy soft topology generated by $\beta$. Obviously, $\Phi_E \in \tau_\beta$. There is $\bigcup_{f A \in \beta} f_A = I_E$ for each $e \in E$ and $x \in U$, then $I_E \in \tau_\beta$. Let $A, B \in E$ and $f_A, g_B \in \tau_\beta$, then by Definition 3.5, for every $e \in E$ and $x \in U$, there is $h_c \in \beta$ such that $h_c \subseteq f_A \cap g_B$, where $C \subseteq A \cap B \subseteq E$. Since $h_c \subseteq f_A \cap g_B$, then $f_A \cap g_B \in \tau_\beta$. Let $(f_a)_{a \in \tau_\beta}$ for all $a \in \beta$, for each $e \in E$ and $x \in U$ then by Definition 3.5, there exists $I_E = \bigcup_{f_A \in \beta} f_A$ such that $I_E \subseteq \bigcup (f_a)_{a \in \tau_\beta}$. Therefore, $\tau_\beta$ is an intuitionistic fuzzy soft topology on $U$. ■

**Theorem 3.10.** Let $(U, E, \tau)$ be an intuitionistic fuzzy soft topological space, and let there is given a sub collection $\beta$ of $\tau$. If every element of $\tau$ can be defined by a union of some members of $\beta$, then $\beta$ is an intuitionistic fuzzy soft basis for $\tau$ on $U$.

**Proof.** Let $\tau$ is an intuitionistic fuzzy soft topology on $U$. Since $\Phi_E \in \tau$, then $\Phi_E \in \beta$. Again since $I_E \in \tau$, then $I_E = \bigcup f_A$. Let $f_A, g_B \in \beta$ and $A, B \in E$. Then $f_A, g_B \in \tau$ and so $f_A \cap g_B \in \tau$. Then there exists $(h_a)_{a \in \beta}$ such that $f_A \cap g_B = \bigcup (h_a)_{a \in \beta}$. Thus $f_A(e) \land g_B(e) = \bigvee (h_a)_{a \in \beta}$, for $e \in E$. That is mean $\min\{\mu_{f_A}(x), \mu_{g_B}(x)\} = \max\{\mu_{f_A}(x), \mu_{g_B}(x)\}$ and $\max\{v_{f_A}(x), v_{g_B}(x)\} = \min\{v_{f_A}(x), v_{g_B}(x)\}$ for $e \in E$ and $x \in U$. Then there is $\alpha \in \Gamma$ such that $\min\{\mu_{f_A}(x), \mu_{g_B}(x)\} = \mu_{f_A}(x)$, and $\max\{v_{f_A}(x), v_{g_B}(x)\} = v_{f_A}(x)$. Therefore for $e \in E$ and $x \in U$, we get $(h_a)_{a \in \beta} \subseteq \beta$ such that $(h_a)_{a \in \beta} \subseteq f_A \land g_B$. Hence $\beta$ is a basis for $\tau$ on $U$. ■

**Definition 3.11.** A collection $\Omega$ is said the intuitionistic fuzzy soft subbasis for $\tau$ if and only if the collection of all finite intersections of elements of $\Omega$ is an intuitionistic fuzzy soft basis for $\tau$ on $U$.

**Example 3.12.** Let $U = \{x_1, x_2\}$ and $e \in E$. Let $f_E, g_E, l_E \in IFS^U$ that defined by

\[
\begin{align*}
  f_E &= \{e, \{(x_1, 1,0), (x_2, 0,7,0)\}\} \\
  g_E &= \{e, \{(x_1, 0,5,0), (x_2, 1,0)\}\} \\
  l_E &= \{e, \{(x_1, 0,5,0), (x_2, 0,7,0)\}\}
\end{align*}
\]

Then $\beta = \{f_E, g_E, l_E, \Phi_E\}$ is a basis for $\tau$ on $U$. The collection $\Omega$ that defined by $\Omega = \{f_E, g_E, \Phi_E\}$ is a subbasis for $\tau$ on $U$. This is will be shown by using Definition 3.11. look that

1. If $f_E, \Phi_E \in \Omega$, then $f_E \cap \Phi_E = \Phi_E \in \beta$.
2. If $g_E, \Phi_E \in \Omega$, then $g_E \cap \Phi_E = \Phi_E \in \beta$.
3. If $f_E, g_E \in \Omega$, then $f_E \cap g_E = \{e, \{(x_1, 0,5,0), (x_2, 0,7,0)\}\} = l_E \in \beta$.
4. If $f_E, g_E, \Phi_E \in \Omega$, then $f_E \cap g_E \cap \Phi_E = \Phi_E \in \beta$.

Therefore, The collection $\Omega$ that defined by $\Omega = \{f_E, g_E, \Phi_E\}$ is a subbasis for $\tau$ on $U$.

**Theorem 3.13.** An intuitionistic fuzzy soft subbasis $\Omega$ for a suitable intuitionistic fuzzy soft topology $\tau$ if and only if

1. $\Phi_E \in \Omega$ or $\Phi_E$ is the intersection of a finite number of elements of $\Omega$.
2. $l_E = \bigcup \Omega$.

**Proof.** First suppose that $\Omega$ is an intuitionistic fuzzy soft subbasis for $\tau$ and let $\beta$ is a basis generated by $\Omega$. Since $\Phi_E \in \beta$, either $\Phi_E \in \Omega$ or $\Phi_E$ is an intersection of finitely many members of $\Omega$. Next suppose that $x \in U$ and $e \in E$. Since $\bigcup_{f A \in \beta} f_A = I_E$, there is $f_A \in \beta$ such that $\mu_{f_A}(x) = 1$ and $v_{f_A}(x) = 0$ for each $x \in U$. Since $f_A \in \beta$ there exist $S_A \subseteq \Omega$, $i = 1, 2, ..., n$ such that $f_A = \bigcap_{i=1}^n S_A^i$.  

\[\text{Therefore, } \Omega \text{ is an intuitionistic fuzzy soft subbasis for } \tau \text{ if and only if}
\]

\[1. \text{ } \Phi_E \in \Omega \text{ or } \Phi_E \text{ is the intersection of a finite number of elements of } \Omega.
\]

\[2. \text{ } l_E = \bigcup \Omega.
\]
Then $\mu_{f_A}(x) = \min_{i=1}^{n} \mu_{S^i_{A_i}}(x)$ and $\nu_{f_A}(x) = \max_{i=1}^{n} \nu_{S^i_{A_i}}(x)$. Therefore $\mu_{f_A}(x) = \mu_{S^i_{A_i}}(x)$ and $\nu_{f_A}(x) = \nu_{S^i_{A_i}}(x)$, for some $i \in \{1,2,\ldots,n\}$. Hence $\mu_{S^i_{A_i}}(x) = 1$ and $\nu_{S^i_{A_i}}(x) = 0$. Therefore $I_E = \cup \Omega$.

Conversely suppose that $\Omega$ is a collection of some intuitionistic fuzzy soft sets over $U$ satisfying the assumptions (1) and (2). Let $\beta$ is the collection of all finite intersections of elements of $\Omega$. Now it enough to show that $\beta$ forms basis for suitable intuitionistic fuzzy soft topology. By condition (1) we get $\Phi_E \in \beta$ and by (2) we get $\cup_{f_A \in \beta} f_A = I_E$. Then let $f_A, g_B \in \beta$ and $x \in U$, $e \in E$. Since $f_A \in \beta$, there is $f_{A_i}^j \in \Omega$, for $i = 1,2,\ldots,n$ such that $f_A = \cap_{i=1}^{n} f_{A_i}^{i}$, where $A = \cap_{i=1}^{n} A_i$. Again since $g_B \in \beta$, there exists $g_{B_j}^j \in \Omega$, for $j = 1,2,\ldots,m$ such that $g_B = \cap_{j=1}^{m} g_{B_j}^{j}$, where $B = \cap_{j=1}^{m} B_j$. Hence $f_A \cap g_B = \left( \cap_{i=1}^{n} f_{A_i}^{i} \right) \cap \left( \cap_{j=1}^{m} g_{B_j}^{j} \right) \in \beta$. That is, $f_A \cap g_B \in \beta$.

4. Conclusion
In this research, we introduced intuitionistic fuzzy soft set, some operation of intuitionistic fuzzy soft set, intuitionistic fuzzy soft topology, intuitionistic fuzzy soft basis and subbasis. Let $\beta$ is the collection of intuitionistic fuzzy soft set, $\beta$ is called to be an intuitionistic fuzzy soft basis for an intuitionistic fuzzy soft topology if there exists null intuitionistic fuzzy soft set and intuitionistic fuzzy universe set of members of $\beta$, and if $f_A$ and $g_B$ are members of $\beta$ then there exists $h_{C}$ is member of $\beta$ such that $h_{C}$ is subset of $f_A \cap g_B$. A subbasis of intuitionistic fuzzy soft set is the collection of intuitionistic fuzzy soft set where all finite intersections of members of that collection is an intuitionistic fuzzy soft basis for topology.

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