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On Intuitionistic Fuzzy Slightly πgb-Continuous Functions

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Abstract: In this paper we introduce and study the concepts of intuitionistic fuzzy slightly πgb-continuous functions, we investigate some of their properties. By using intuitionistic fuzzy slightly πgb-continuous-function some properties of separation axioms are discussed.

Keywords: Intuitionistic fizzy topology, intuitionistic fuzzy πgb-closed set, intuitionistic fuzzy clopen set, intuitionistic fuzzy slightly πgb-continuous, 2010 AMS Classification: 54A40, 03E72

I. INTRODUCTION

The concept of fuzzy set was introduced by L. A. Zadah [13]. The fuzzy concept has invaded almost all branches of mathematics. The concept of fuzzy topological space was introduced and develped by C. L. Chang [3]. Atanasov [2] was introduced The concept of imtuitionistic fuzzy set, as a gener- alization of fuzzy set. This approach provided a wide field to the generalization of various concepts of fuzzy mathematics.

In 1997 Coker[6] defined intuitionis-tic fuzzy topological spaces. Recently many concepts of fuzzy topological space have been extended in intuitionistic fuzzy (IF) topological spaces. Ravi, Mar- garet parimalam, Murugesan and Pandi [9] intrduced the concept of slightly πgb-continuous functions. In this paper we introduce and study the conceptsof intuitionistic fuzzy slightly πgb-continuous in intuitionistic fuzzy topological space. Also we apply that concept to study some properties in separation axioms.

II. PRELIMINARIES

Definition 2.1 [2] Let X be a non-empty fixed set. An intuitionistic fuzzy set (IFS in short) A in X is an object having the form $A=\{<x,\mu_A(x),\nu_A(x)>: x\in X\}$,where the function $\mu_A(x): X\to[0,1]$ and $\nu_A(x): X\to[0,1]$ denote the degree of membership (namely $\mu_A(x)$)and the degree of non-membership (namely $\nu_A(x)$) of each element x∈X to the set A, respectively, and $0\le\mu_A+\nu_A\le 1$ for each x ∈X. Denote by IFS(X), the set of all intuitionistic fuzzy sets in X.

Definition 2.2 [2] Let A and B be IFSs of the form $A=\{<x,\mu_A(x),\nu_A(x)>: x\in X\}$ and $B=\{<x,\mu_B(x),\nu_B(x)>: x\in X\}$ Then :

(a) $A\subseteq B$ if and only if $\mu_A(x)\le\mu_B(x)$ and $\nu_A(x)\ge\nu_B(x)$ for all $x\in X$

(b) $A=B$ if and only if $A\subseteq B$ and $B\subseteq A$

(c) $A^c=\{<x,\nu_A(x),\mu_A(x)>: x\in X\}$

(d) $A\cap B=\{<x,\mu_A(x)\wedge\mu_B(x),\nu_A(x)\vee\nu_B(x)>: x\in X\}$

(e) $A\cup B=\{<x,\mu_A(x)\vee\mu_B(x),\nu_A(x)\wedge\nu_B(x)>: x\in X\}$

(f) $0_\sim=\{<x,0,1>: x\in X\}$ and $1_\sim=\{<x,1,0>: x\in X\}$

(g) $0_\sim^c=1_\sim$ and $1_\sim^c=0_\sim$

Definition 2.3 [4] Let $\alpha,\beta\in[0,1]$ such that $\alpha+\beta\le 1$. An intuitionistic fuzzy point (IFP) $p_{(\alpha,\beta)}$ is intuitionistic fuzzy set

$$p_{(\alpha,\beta)}=\begin{cases}(\alpha,\beta) & if \quad x=p\\ (0,1) & if \quad otherwise\end{cases}$$

Clearly an intuitionistic fuzzy point can be represented by an ordered pair offuzzy point as follows: $p_{(\alpha,\beta)}=(p_\alpha,p_{(1-\beta)})$

In this case, p is called the support of $p_{(\alpha,\beta)}$ and α,β are called the value andno value of $p_{(\alpha,\beta)}$ respectively.

An IFP $p_{(\alpha,\beta)}$ is said to belong to an IFS $A=\{<x,\mu_A,\nu_A>: x\in X\}$ denoted by $p_{(\alpha,\beta)}\in A$, if $\alpha\le\mu_A(x)$ and $\beta\ge\nu_A(x)$.

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Definition 2.4 [2] Let X and Y be two nonempty sets and $f : X \to Y$ be afunction. Then

(a) If $B = \{< y, \mu_B(y), \nu_B(y) >: y \in Y\}$ is an IF S in Y, then the preimage of B under f denoted by $f^{-1}(B)$ is the IF S in X defined by

$$f^{-1}(B) = \left\{< x, f^{-1}(\mu_B)(x), f^{-1}(\nu_B)(x) >: x \in X\right\}$$

(b) If $A = \{< x, \mu_A(x), \nu_A(x) >: x \in X\}$ is an IF S in X, then the image of A under f denoted by f (A) is the IF S in Y defined by

$$f(A) = \left\{< y, f(\mu_A)(y), 1 - f(1-\nu_A)(y) >: y \in Y\right\}$$

Where,

$$f(\mu_A)(y) = \begin{cases} \sup\limits_{x \in f^{-1}(y)} \mu_A(x) & if \quad f^{-1}(y) \neq 0_\sim \\ 0 & if \quad otherwise \end{cases}$$

$$1 - f(1-\nu_A)(y) = \begin{cases} \sup\limits_{x \in f^{-1}(y)} \nu_A(x) & if \quad f^{-1}(y) \neq 0_\sim \\ 1 & if \quad otherwise \end{cases}$$

Replacing fuzzy sets [13] by intuitionistic fuzzy sets in Chang definition of fuzzy topological space [3] we get the following.

Definition2.5 [5] An intuitionistic fuzzy topology (IFT in short) on X is a family τ of IFSs in X satisfying the following axioms

(T_1) $0_\sim$, $1_\sim \in \tau$

(T_2) If $G_1, G_2 \in \tau$, then $G_1 \cap G_2 \in \tau$

(T_3) If $G_i \in \tau$ for each i in I, then $\bigcup_{i \in I} G_i \in \tau$.

In this case the pair (X, τ) is called an intuitionistic fuzzy topological space (IFTS in short) and any IFT in τ is known as an intuitionistic fuzzy open set (IFOS in short) in X. the complement A^C of an IFOS A in an IFTS (X, τ) is called an intuitionistic fuzzy closed set (IFCS in short) in X.

Definition 2.6 [5] Let $p(\alpha,\beta)$ be an IFP in IFTS X. An IFS A in X is called anIF neighborhood (IFN) of $p(\alpha,\beta)$ if there exists an IFOS B in X such that $p(\alpha,\beta) \in B \subseteq A$.

Definition 2.7 [6] A subset of an intuitionistic fuzzy space X is said to be clopen if it is intuitionistic fuzzy open set and intuitionistic fuzzy closed set.

Definition 2.8 [3] Let (X, τ) be an IFTS and A = {< x, $\mu_A(x)$, $\nu_A(x)$ >: x ∈ X} be an IFS in X. Then the intuitionistic fuzzy interior and an intuitionistic fuzzy clousre are defined by

int(A) =∪ {G : G is an IFOS in X and G ⊆ A}

cl(A) = ∩{K : K is an IFCS in X and A ⊆ K}

Definition 2.9 An IFS A of an IFTS (X, τ) is an :

(1) Intuitionistic fuzzy regular open set(IFROSin short) [6] if int(cl(A))=A.

(2) Intuitionistic fuzzy regular closed set (IFRCS in short) [6] if cl(intl(A))=A.

(3) intuitionistic fuzzy π-open set (IFπOS in short)[11] if the finite union of intuitionistic fuzzy regular open sets.

(4) intuitionistic fuzzy π-closed set (IFπCS in short)[11] if the finite intersection of intuitionistic fuzzy regular closed sets.

(5) intuitionistic fuzzy generalized open set (IFGOS in short)[12] if F ⊆int(A) whenever F ⊆ A and F is an IFCS in X.

(6) intuitionistic fuzzy generalized closed set (IFGCS in short) [12] if cl(A)⊆U whenever A ⊆ U and U is an IFOS in X.

(7) intuitionistic fuzzy b-open set (IFbOS in short)[7] if A ⊆ cl(int(A))∪ int(cl(A)).

(8) intuitionistic fuzzy b-closed set (IFbCS in short)[7] if cl(int(A)) ∪ int(cl(A)) ⊆ A.

Definition 2.10 [8] Let (X, τ) be an IFTS and A be an IFS in X. Then the intuitionistic fuzzy interior and an intuitionistic fuzzy clousre are defined by :

bint(A) = ∪{G : G is an IFbOS in X and G ⊆ A}

bcl(A) = ∩{K : K is an IFbCS in X and A ⊆ K}

Definition 2.11 An IFS A of an IFT S (X, τ) is an :

(1)intuitionistic fuzzy gb-open set (IFGbOS in short)[8] if F ⊆ bint(A) whenever F ⊆ A and F is an IFCS inX.

(2) intuitionistic fuzzy gb-closed set (IFGbCS in short)[8] if bcl(A) ⊆U whenever A ⊆ U and U is an IFOSinX.

(3) intuitionistic fuzzy πg-open set (IFπgOS in short) if F ⊆ int(A)whenever F ⊆ A and F is an IFπCS in X.

(4) intuitionistic fuzzy πg-closed set (IFπgCS in short) if cl(A) ⊆ U whenever A ⊆ U and U is an IFπOS in X.

Definition 2.12 An IFS A of an IFTS (X, τ) is an

(1) intuitionistic fuzzy πgb-open set (IFπgbOS in short) If F ⊆ bint(A) whenever F ⊆ A and F is an IFπCS in X.

(2) intuitionistic fuzzy πgb-closed set (IFπgbCS in short) if bcl(A)⊆U, whenever A ⊆ U and U is an IFπOS in X.

Definition 2.13 Let f be a mapping from an IFTS (X, τ) into an IFTS (Y, σ). Then $f$is said to be an :

(1) intuitionistic fuzzy π-irresolute if f^{-1}(F) is intuitionistic fuzzy π-closed in X for every intuitionistic fuzzy π-closed set F of Y .

(2) intuitionistic fuzzy πgb-continuous if f^{-1}(F) is πgb-closed in X for every intuitionistic fuzzy closed set F of Y.

(3) intuitionistic fuzzy πgb-continuous if the inverse image of every intuitionistic fuzzy clopen set in Y is an intuitionistic fuzzy πgb-open (resp.I F πgb-clopen) set in X.

(4) intuitionistic fuzzy totally continuous if in verse image of every intuitionistic fuzzy open set in Y is an intuitionistic fuzzy clopen set in X.

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III. MAIN RESULTS

This section is devoted to introduce and investigate of intuitionistic fuzzy slightly πgb-continuous.

Definition 3.1 A function f: (X, τ) → (Y, σ) is called an intuitionistic fuzzy slightly π-generalized b-continuous (brieftly IF slightly πgb-continuous) if the inverse image of every IF clopen set in Y is IF πgb-open in X.

Definition3.2 A function$f$:(X,τ)$\tilde{\rightarrow}$(Y,σ) froma IFTS (X,τ) to another IFTS (Y,σ) is said to be an IF slightly πgb-continuous if for each IFP $p(\alpha,\beta)$∈X and each IF clopen set B in Y containing $f(p(\alpha,\beta))$, there exists an IFπgb-open set A in X such that $f(A) \subseteq B$

Theorem 3.3 Let f : (X, τ) → (Y, σ) be a function from an IFTS (X, τ) to another IFTS (Y, σ) then the following statements are equivalent
1. f is an IF slightly πgb-continuous.
2. Inverse image of every IF clopen set in Y is an IF πgb-open in X.
3. Inverse image of every IF clopen set in Y is an IF πgb-closed in X.
4. Inverse image of every IF clopen set in Y is an IF πgb-clopen in X

Proof. (1) ⇒ (2) Let B be an IF clopen set in Y and let $(p(\alpha,\beta)) \in f^{-1}(B)$. Since $f(p(\alpha,\beta)) \in B$ by (1) there exists an IF πgb-open set A in X containing $p(\alpha,\beta)$ such that $A_{p(\alpha,\beta)} \subseteq f^{-1}(B)$ we obtain that $f^{-1}(B) = \bigcup_{p(\alpha,\beta)\in f^{-1}(B)} A_{p(\alpha,\beta)}$, which is an IF πgb-open in X.

(2)⇒(3) Let B be an IF clopen set inY ,then B^C is IF clopen. By (2)$f^{-1}(B^C) = (f^{-1}(B))^C$ is an IF πgb-open, thus $f^{-1}(B)$ is an IF πgb-closed set.

(3)⇒ (4) Let B be an IF clopen set in Y.Then by (3) $f^{-1}(B)$ is IF πgb- closed set. Also B^C is an IF clopen and
(3) implies $f^{-1}(B^C) = (f^{-1}(B))^C$ is an IFπgb-closed set. Hence $f^{-1}(B)$ is an IFπgb-clopen set.
(4)⇒(1) Let B be an IF clopen set in Y containing $f(p(\alpha,\beta))$. By (4),$f^{-1}(B)$ is an IF πgb-open. Let us take $A = f^{-1}(B)$, then $f(A) \subseteq B$. Hence f is an IF slightly πgb-continuous.■

Definition3.4 The intersection of all IFπgb-closed sets containing an IF set A is called an IFπgb-closure of A and denoted by πgbcl(A),and the union of all IFπgb-open sets contained in an IF set A is called an IFπgb-interior of A and denoted by πgbint(A).

Remark3.5 If A = πgbcl(A), then A need not be an IFπgb-closed.

Remark 3.6 The union of two IFπgb-closed sets is generally not an IFπgb- closed set and the intersection of two IFπgb-open sets is generally not an IFπgb open set

Example3.7 LetX={a,b,c}andletτ={0∼,1∼,A,B,C}isIF Ton X, where A={<a,0,1>,<b,1,0>,<c,0,1>},B={<a,0,1>,<b,0,1>,<c,1,0>}andC={<a,0,1>,<b,1,0>,<c,1,0>}.Then the IFSs A^C,B^C are IFπgbOSs but $A^C \cap B^C = C^C$ is not an IFπgbOS of X, since $C^C \subseteq C^C$ and$C^C \nsubseteq$ bint(C^C) = 0, And the IFSs A, B are IFπgbCSs but A ∪ B = C is not an IFπgbCS of X, since C ⊆ C and bcl(C) = 1∼⊈ C.

Proposition 3.8 Every intuitionistic fuzzy πgb-continuous is anintuitionistic fuzzy slightly πgb-continuous. But the converse need not be true.

Example 3.9 Let X = {a, b}, Y = {u, v} and
A = {< a, 1, 0 >,< b, 0, 1 >},
B={<a,0,1>,<b,0.8,0.2>},
C={<a,1,0>,<b,0.8,0.2>},
D={<u, 0.7, 0.3 >,<v, 0.5, 0.5>}.

Then τ = {0∼, 1∼, A, B, C} and σ = {0∼, 1∼, D} are IFTS on X and Y respectively. Define a mapping f: (X, τ) → (Y, σ) by$f$(a)= u and f(b) = v. Then f is an IF sllightly πgb-continuous but not an IFπgb-continuous. Since $f^{-1}(D^C)$={<a,0.3,0.7>, <b,0.5,0.5>}⊆C (π–open set) and bcl($f^{-1}(D^C)$)=1∼⊈C

Proposition3.10 Every intuitionistic fuzzy πgb-irresolute function is an intuitionistic fuzzy slightly πgb-continuous. But the converse need not be true.

Theorem 3.11 Iff: X → Y is an IF slightly πgb-continuous and g : Y → Z is an IF totally continuous then g ∘ $f$is an intuitionistic fuzzy πgb-continuous.

Proof. Let B be an IFOS in Z, since g is an IF totally continuous, g−1(B) is an IF clopen set in Y. Now $(g \circ f)^{-1}(B) = f^{-1}(g^{-1}(B))$. Since$f$ is an IF slightly πgb-continuous, $f^{-1}(g^{-1}(B))$ is an IFπgbOS in X. Hence g ∘ f is an intuitionistic fuzzy πgb-continuous.■

Lemma 3.12 Let f: X → Y be bijective, IF π-irresolute and IF strongly b- closed. Then for every IFπgb-closed set A of X, f(A) is an IFπgb-closed in Y .

Proof. Let A be any IFπgb-closed set of X and V an IFπgb-open set of Ycontaining f(A). Since f^{-1}(V) is an IFπ-open set of X containing A, bcl(A) ⊆ f^{-1}(V) and hence f(bcl(A))⊆V. Since f is an IF strongly b-closed and bcl(A) is an IFb-closed in X f(bcl(A)) is an IFb-closed in

Y. Sinse bcl(f(A)) ⊆ bcl(f(bcl(A))) ⊆V, bcl(f (A))⊆V. Therefore f(A) is an IFπgb-closed in Y.■

Theorem 3.13 Let f: X → Y and g : Y → Z be an intuitionistic fuzzy functions. If f is a bijective, IF π-irresolute and IF strongly b-closed and if $g \circ f$: X → Z is an IF slightly πgb-continuous, then g is an IF slightly πgb-continuous.

Proof. Let V be an IF clopen subset of Z. Then $(g \circ f)^{-1}(V) = (f^{-1} \circ g^{-1})(V) = f^{-1}(g^{-1}(V))$ is IFπgb-closed in X. Then by (3.12), $g^{-1}(V)=f(f^{-1}(g^{-1}(V)))$ is an IFπgb-closed in Y. Therefore g is an IF slightly πgb-continuous.■

Theorem 3.14 A mapping f:(X,τ)→(Y,σ) from an IFTS (X,τ) to another IFTS (Y,σ) is an IF slightly πgb-continuous if and only if for each IFP $p_{(\alpha,\beta)}$ in X and IF clopen set B in Y such that $f(p_{(\alpha,\beta)})$ ∈B, cl(f^{-1}(B)) is an IFN of IFP $p_{(\alpha,\beta)}$ in X.

Proof. Let f be any IF slightly πgb-continuous mapping, p(α,β) be an IFP in X and B be any IF clopen set in Y such that $f(p_{(\alpha,\beta)})$ ∈ B. Then $p_{(\alpha,\beta)} \in f^{-1}(B) \subseteq bcl(f^{-1}(B)) \subseteq cl(f^{-1}(B))$. Hence cl($f^{-1}$ (B)) is an IFN of $p_{(\alpha,\beta)}$ in X.

Conversely, let B be any IF clopen set in Y and p(α,β) be an IFP in X such that f $(p_{(\alpha,\beta)})$ ∈B. Then $p_{(\alpha,\beta)} \in f^{-1}(B)$. According to assumption cl(f^{-1}(B)) is an IFN of IFP p(α,β) in X. So, p(α,β) ∈ $f^{-1}(B) \subseteq cl(f^{-1}(B))$, and by (definition of IF slightly πgb-continuous) there exists an IFπgb-open A in X such that $p_{(\alpha,\beta)}$∈ A ⊆f^{-1}(B).Therefore f is an IF slightly πgb-continuous.■

IV. SOME APPLICATION THEOREMS

Definition 4.1 An IFT S (X, τ) is called (πgb − T0)(co − T0) if and only if for each pair of distinct intuitionistic fuzzy points, $x_{(\alpha,\beta)}$, $y_{(\nu,\delta)}$ in X there exist an intuitionistic fuzzy πgb-open set (IF clopen set) U, ∈ X such that x(α,β) ∈U,$y_{(\nu,\delta)}$∉U.

Theorem4.2 If f:(X,τ)→(Y,σ) is an IF slightly πgb-continuous, bijection and Y is co−T0, then X is an IFπgb-T0.

Proof. Suppose that Y is IF co − T0, For any distinct intuitionistic fuzzy points $x_{(\alpha,\beta)}$, $y_{(\nu,\delta)}$ in X, there exists an IF clopen set A in Y such that $f(x_{(\alpha,\beta)})$ ∈ A and $f(y_{(\nu,\delta)})$ ∉ A Since f is an IF slightly πgb-continuous an bijection f^{-1}(A) is an IFπgb-open sets in X such that $x_{(\alpha,\beta)} \in f^{-1}(A)$, $y_{(\nu,\delta)} \notin f^{-1}(A)$. This shows that X is an IFπgb−T_0. ■

Definition4.3 An IFTS (X,τ) is called (πgb−T_1) (co−T_1) if and only if for each pair of distinct intuitionistic fuzzy points, $x_{(\alpha,\beta)}$, $y_{(\nu,\delta)}$ in X there exists an intuitionistic fuzzy πgb-open sets (IF clopen sets) U, V ∈ X such that $x_{(\alpha,\beta)}$ ∈U, y(ν, δ) ∉U and, $y_{(\nu,\delta)}$ ∈ V, $x_{(\alpha,\beta)}$ ∉ V.

Theorem4.4 If f : (X,τ)→(Y,σ) is an IF slightly πgb-continuous, injection and Y is co−T_1, then X is an IFπgb-T_1.

Proof. Suppose that Y is an IF co − T_1, For any distinct intuitionistic fuzzy points $x_{(\alpha,\beta)}$, $y_{(\nu,\delta)}$ in X, there exists an IF clopen sets A, B in Y such that $f(x_{(\alpha,\beta)})$ ∈ A , $f(y_{(\gamma,\delta)})$ ∉ A, $f(x_{(\alpha,\beta)})$∉B, and f $(y_{(\nu,\delta)})$ ∈B.

Since f is an IF slightly πgb-continuous, f^{-1}(A) and f^{-1}(B) are IFπgb-open sets inX such that $x_{(\alpha,\beta)} \in f^{-1}(A)$, $y_{(\nu,\delta)} \notin f^{-1}(A)$, $x_{(\alpha,\beta)} \notin f^{-1}(B)$ and $y_{(\nu,\delta)} \in f^{-1}(B)$. This shows that X is an IFπgb−T_1■

Definition 4.5 An IFT S X is said to be πgb − T_2or πgb-Hausdorff (co-T_2or co–Hausdorff) if for all pair of distinct intuitionistic fuzzy points $x_{(\alpha,\beta)}$, $y_{(\nu,\delta)}$in X there exits an IFπgb-open sets (IFclopen sets) U,V∈X such that $x_{(\alpha,\beta)}$ ∈ U, y(ν,δ) ∈ V and U ∩ V = 0∼.

Theorem4.6 If f:(X,τ)→(Y,σ) is an IF slightly πgb-continuous ,injection and Y is co−T_2, then X is an IFπgb−T_2.

Proof. Suppose that Y is IF co − T2 space then for any distinct intuitionistic fuzzy points x(α,β), y(ν,δ) in X, there exists an IF clopen sets A, B in Y such that f $(x_{(\alpha,\beta)})$ ∈A, and $f(y_{(\nu,\delta)})$ ∈B. Since f is IF slightly πgb-continuous, f^{-1}(A) and f^{-1}(B) are IFπgb open sets in X such that x(α,β) ∈ f^{-1}(A), and $y_{(\nu,\delta)} \in f^{-1}$(B). Also we have

$f^{-1}(A) \cap f^{-1}(B) = 0_\sim$■

Definition4.7 An IFTS X is said to be co-regular (respectively IF slightly πgb-regular) if for each clopen (respectively IFπgb-clopen) set C and eachIF$x_{(\alpha,\beta)}$∉C, there exist an intuitionistic fuzzy open sets A and B such that C⊆A , $x_{(\alpha,\beta)}$∈B and A∩B=0∼.

Theorem4.8 If f is an IF slightly πgb-continuous injective IF open function from an IF strongly πgb-regular space X onto an IF space Y, then Y is IF co-regular.

Proof. Let D be an IF clopen set in Yand $y_{(\gamma,\delta)} \notin D$. Take $y_{(v,\delta)} = f(x_{(\alpha,\beta)})$. Since f is an IF slightly πgb-continuous, $f^{-1}(D)$ is an IFπgb-closed set inX. Let $C=f^{-1}(D)$. So $x_{(\alpha,\beta)} \notin C$. Since X is IF strongly πgb-regular, there exists IFOS's A and B such that C⊆A, $x_{(\alpha,\beta)} \in B$ and $A \cap B = 0_\sim$. Hence we have $D=f(C)\subseteq f(A)$ and $y_{(v,\delta)}=f(x_{(\alpha,\beta)})\in f(B)$ such that f (A) and f (B) are disjoint IF open sets. Hence Y is an IFco-regular. ∎

Definition 4.9 An IFTS X is said to be an IF co-normal (respectively IF strongly πgb-normal) if for each IF clopen (respectively IFπgb-closed) sets C_1 and C_2 in X such that $C_1 \cap C_2 = 0_\sim$, there exist an intuitionistic fuzzy open sets A and B such that $C_1 \subseteq A$ and $C_2 \subseteq B$ and $A \cap B = 0_\sim$.

Theorem4.10 If f is an IF slightly πgb-continuous injective IF open function from an IF strongly πgb-normal space X onto an IF space Y, then Y is an IFco-normal.

Proof. Let $C_1$and C_2be disjoint IF clopen sets in Y . Since f is an IF slightly πgb-continuous, $f^{-1}(C_1)$ and $f^{-1}(C_2)$ are IFπgb-closed sets in X. Let us take $C = f^{-1}(C_1)$ and $D = f^{-1}(C_2)$. We have $C \cap D = 0_\sim$. Since X is an IF strongly πgb-normal, there exist disjoint IF open sets A and B such that C⊆A and D⊆B. Thus $C_1=f(C)\subseteq f(A)$ and $C2=f(D)\subseteq f(B)$ such that $f(A)$ and $f(B)$ disjoint IF open sets. Hence Y is an IFco-normal. ∎

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