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IF Generalized Alpha Supra Continuous Mappings In Intuitionistic Fuzzy Supra Topological Spaces

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Abstract - **Intuitionistic Fuzzy Supra topological space introduced by Necla Turanl which is a special case of Intuitionistic fuzzy topological space. Aim of this present paper is we introduce and investigate the concepts of IFGα supra continuous mappings and IFGα supra irresolute mappings in Intuitionistic fuzzy supra topological spaces.**

*Keywords —**IFGα supra open sets, IFGα supra closed sets, IF supra continuous mappings, IFGα supra continuous mappings and IFGα supra irresolute mapping***

I. INTRODUCTION

L.A. Zadeh's[24]introduced fuzzy sets, using these fuzzy sets C.L. Chang [4] introduced and developed fuzzy topological space. Atanassov's[2] introduced Intuitionistic fuzzy sets, Using this Intuitionistic fuzzy sets Coker[5] introduced the notion of Intuitionistic fuzzy topological spaces

The supra topological spaces introduced and studied by A.S. Mashhour[10] in the year 1983. M. E. AbdEl-Monsef et al. [1] introduced the fuzzy supra topological spaces and studied fuzzy supra-continuous functions and obtained some properties and characterizations. In 2003 Necla Turanl [23] introduced the concept of Intuitionistic fuzzy supra topological space.

M. Parimala, [13]Jafari Saeid, introduced Intuitionistic fuzzy α-supra continuous maps in Intuitionistic fuzzy supra topological spaces. S.Chandrasekar [21]et al introduced IFGα supra closed sets. Aim of this present paper is we introduce and investigate the concepts of IFGα supra continuous mappings and IFGα supra irresolute mappings in Intuitionistic fuzzy supra topological spaces.

II. PRELIMINARIES

Definition 2.1[3]

An Intuitionistic fuzzy set (IF for short) A is an object having the form

$$A = \{\langle x, \mu_A(x), \nu_A(x)\rangle : x \in X\}$$

where the functions μ_A:X⟶[0,1] and ν_A:X⟶ [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 $0 \le \mu_A(x) + \nu_A(x) \le 1$ for each x ∈ X. Obviously, every fuzzy set A on a nonempty set X is an IFS of the following form

$$A = \{\langle x, \mu_A(x), 1- \mu_A(x)\rangle: x \in X\}.$$

Definition 2.2 [3]

Let A and B be two Intuitionistic fuzzy sets of the form $A = \{\langle x, \mu_A(x), \nu_A(x)\rangle: x \in X\}$ and $B = \{\langle x, \mu_B(x), \nu_B(x)\rangle : x\in X\}$. Then,

(i) A ⊆ B if and only if $\mu_A(x) \le \mu_B(x)$ and $\nu_A(x) \ge \nu_B(x)$ for all x ∈ X,

(ii) A = B if and only if A ⊆ B and A ⊇ B,

(iii) $A^C = \{\langle x, \nu_A(x), \mu_A(x)\rangle: x \in X\}$,

(iv) $A \cup B = \{\langle x, \mu_A(x) \vee \mu_B(x), \nu_A(x) \wedge \nu_B(x)\rangle: x \in X\}$,

(v) $A \cap B = \{\langle x, \mu_A(x) \wedge \mu_B(x), \nu_A(x) \vee \nu_B(x)\rangle: x \in X\}$.

(vi) [ ]A= $\{\langle x, \mu_A(x), 1 - \mu_A(x)\rangle, x \in X\}$;

(vii) ⟨⟩A = $\{\langle x, 1 - \nu_A(x), \nu_A(x)\rangle, x \in X\}$;

The Intuitionistic fuzzy sets 0~ = ⟨x, 0, 1⟩ and 1~ = ⟨x, 1, 0⟩ are respectively the empty set and the whole set of X

Definition 2.3. [3]

Let $\{A_i : i \in J\}$ be an arbitrary family of Intuitionistic fuzzy sets in X. Then

(i) $\cap A_i = \{\langle x, \wedge\mu_{A_i}(x), \vee\nu_{A_i}(x)\rangle : x \in X\}$;

(ii) $\cup A_i = \{\langle x, \vee\mu_{A_i}(x), \wedge\nu_{A_i}(x)\rangle : x \in X\}$.

Definition 2.4.[3]

we must introduce the Intuitionistic fuzzy sets 0~ and 1~in X as follows:

0~ = {⟨x, 0, 1⟩: x ∈X} and 1~ = {⟨x, 1, 0⟩ :x ∈X}.

Definition 2.5[3]

Let A, B, C be Intuitionistic fuzzy sets in X. Then

(i) A ⊆B and C ⊆D ⇒A ∪C B∪D and A ∩ C ⊆B ∩ D,

(ii) A ⊆B and A ⊆C ⇒A ⊆B ∩ C,

(iii) A ⊆C and B ⊆C ⇒A ∪B ⊆C,

(iv) A⊆B and B ⊆C ⇒A ⊆C,

(v) $\overline{A \cup B} = \bar{A} \cap \bar{B}$

(vi) $\overline{A \cap B} = \bar{A} \cup \bar{B}$,

(vii) A ⊆B ⇒ $\bar{B} \subseteq \bar{A}$,

(viii) $\overline{(\bar{A})}$= A,

(ix) $\bar{1}$~ = 0~,

(x) $\bar{0}$~ = 1~.

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Definition 2.6[3]

Let f be a mapping from an ordinary set X into an ordinary set Y ,If B ={⟨y, $\mu_B(y)$, $\nu_B(y)$ ⟩: y ∈Y } is an IFST in Y , then the inverse image of B under f is an IFST defined by $f^{-1}(B)$ = {⟨x, $f^{-1}(\mu_B)(x)$, $f^{-1}(\nu_B)(x)$ ⟩: x ∈X}The image of IFST A = {⟨y, $\mu_A(y)$, $\nu_A(y)$ ⟩: y ∈Y } under f is an IFST defined by f(A) = {⟨y, f(μ_A)(y), f(ν_A)(y) ⟩: y ∈Y }.

Definition 2.7 [3]

Let A, A_i (i ∈J) be Intuitionistic fuzzy sets in X, B, Bi (i ∈K) be Intuitionistic fuzzy sets in Y and f :X → Y is a function. Then

(i) $A_1 \subseteq A_2 \Rightarrow f(A_1) \subseteq f(A_2)$,

(ii) $B_1 \subseteq B_2 \Rightarrow f^{-1}(B_1) \subseteq f^{-1}(B_2)$,

(iii) A ⊆f^{-1}(f (A)) { If f is injective, then A = f^{-1}(f (A))},

(iv) f (f^{-1}(B)) ⊆B { If f is surjective, then f (f^{-1}(B)) = B },

(v) $f^{-1}(\cup B_j) = \cup f^{-1}(B_j)$

(vi)$f^{-1}(\cap B_j) = \cap f^{-1}(B_j)$

(vii) $f(\cup B_j) = \cup f(B_j)$

(viii) $f(\cap B_j) \subseteq \cap f(B_j)$ {If f is injective, then $f(\cap B_j) = \cap f(B_j)$}

(ix) f^{-1}(1∼) = 1∼ ,

(x) f^{-1}(0∼) = 0∼,

(xi) f (1∼) = 1∼ , if f is surjective

(xii) f (0∼) = 0∼,

(xiii) $\overline{f(A)} \subseteq f(\bar{A})$, if f is surjective,

(xiv) $f^{-1}(\bar{B}) = \overline{f^{-1}(B)}$.

Definition 2.8[22]

A family τ_μ Intuitionistic fuzzy sets on X is called an Intuitionistic fuzzy supra topology (in short,IFST) on X if $0\sim \in \tau_\mu$, $1\sim \in \tau_\mu$ and $\tau_\mu$is closed under arbitrary suprema. Then we call the pair (X,τ_μ) an Intuitionistic fuzzy supra topological space.

Each member of τ_μ is called an Intuitionistic fuzzy supra open set and the complement of an Intuitionistic fuzzy supra open set is called an Intuitionistic fuzzy supra closed set.

Definition 2.9 [22]

The Intuitionistic fuzzy supra closure of a set A is denoted by S-cl(A) and is defined as

S-cl (A) = ∩{B : B is Intuitionistic fuzzy supra closed and A ⊆ B} .

The Intuitionistic fuzzy supra interior of a set A is denoted by S-int(A) and is defined as

S-int(A) = ∪{B:B is Intuitionistic fuzzy supra open and A ⊇ B}

Definition 2.10[23]

(i). ¬ (AqB) ⇔ A ⊆ B^C .

(ii).A is an Intuitionistic fuzzy supra closed set in X⇔S-Cl (A) = A.

(iii). A is an Intuitionistic fuzzy supra open set in X⇔S-int (A)= A.

(iv). S-cl(A^C) = $(\text{S-int}(A))^C$.

(v). S-int(A^C) = $(\text{S-cl}(A))^C$.

(vi). A ⊆ B ⇒ S-int(A) ⊆ S-int(B).

(vii). A ⊆ B ⇒ S-cl(A) ⊆ S-cl(B).

(viii). S-cl(A ∪ B) =S-cl(A)∪ S-cl(B).

(ix). S-int(A ∩ B) = S-int(A)∩S-int(B).

Definition 2.11[23]

An Intuitionistic fuzzy point (IFP in short), written as p(α, β), is defined to be an IFS of X given by

$$P_{(\alpha,\beta)}(x) = \begin{cases} (\alpha,\beta) \text{ if } x = p, \\ (0,1) \text{ otherwise} \end{cases}$$

An IFP p(α, β) is said to belong to a set A if $\alpha \le \mu_A$ and $\beta \ge \nu_A$

Definition 2.12 [23]

An IFS A = ⟨x, μ_A, ν_B⟩in an IFSTS (X, τ_μ) is said to be an

(i) Intuitionistic fuzzy pre supra closed set (IFPSCS in short) if S-cl(S-int(A)) ⊆A

(ii) Intuitionistic fuzzy α- supra closed set (IFαSCS in short) if S-cl(S-int(S-cl(A)) ⊆A

(iii) Intuitionistic fuzzy regular supra closed set (IFRSCS in short) if A = S-cl(S-int(A)),

The family of all IFSCS (respectively IFPSCS, IFαSCS, IFRSCS) of an IFSTS (X,τ_μ) is denoted by IFSC(X) (respectively IFPSC(X), IFαSC(X), IFRSC(X)).

Definition 2.8: [17]

An IFS A of an IFSTS (X, τ_μ) is an Intuitionistic fuzzy generalized supra closed set (IFGSCS in short) if S-cl(A) ⊆U whenever A ⊆U and U is an IFSOS in X.

Definition 2.7: [20]

Let an IFS A of an IFSTS (X, τ_μ). Then

S-cl (A) = ∩{ K / K is an IFSCS in X and A ⊆K }.

S-int(A) = ∪{ K / K is an IFSOS in X and K ⊆A}.

Note that for any IFS A in (X, τ_μ),

S-cl(A^C)= S-int$(A)^C$ and

S-int(A^C) =scl$(A)^C$

Definition 2.13: [21]

An IFS A of an IFSTS (X, τ_μ) is said to be an Intuitionistic fuzzy generalized α supra closed set (IFGαSCS in short) if IFα-Scl(A) ⊆U whenever A ⊆U and U is an IFαSOS in X.

Definition 2.14: [21]

An IFS A of an IFSTS (X, τ_μ) is said to be an Intuitionistic fuzzy generalized α supra open set (IFGαSOS in short) if the complement A^C is an IFGαSCS in X

Definition 2.15:[4]

Let (X, τ_μ) and (Y,σ_μ) be two Intuitionistic fuzzy supra topological spaces. A map f: (X, τ_μ)→ (Y,σ_μ) is called Intuitionistic fuzzy supra contra continuous map if the inverse image of each Intuitionistic fuzzy supra open set in Y is Intuitionistic fuzzy supra closed in X.

Definition 2.7[3]

Let (X, τ_μ) and (Y,σ_μ) be two Intuitionistic fuzzy supra topological spaces. A map f: (X, τ_μ)→ (Y,σ_μ) is called Intuitionistic fuzzy α -supra continuous map if the inverse image of each Intuitionistic fuzzy supra open set in Y is Intuitionistic fuzzy α - supra open in X.

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Result 2.17:[8]

Every IF supra continuous mapping is an IFα supra continuous and every IFα supra continuous mapping is an IF supra continuous mapping.

Definition 2.22:

An IFSTS (X, τ_μ) is said to be an Intuitionistic fuzzy $\alpha_k T_{1/2}$/(IF$\alpha_k T_{1/2}$in short) space if every IFGαSCS in X is an IFSCS in X.

Definition 2.23:

An IFSTS (X, τμ) is said to be an Intuitionistic fuzzy $\alpha_l T_{1/2}$/(IF$\alpha_l T_{1/2}$inshort) space if every IFGαSCS in X is an IFαSCS in X.

Definition 2.24:[15]

The IFS C(α ,β) = {x, c_α, $c_{1-\beta}$}where α ∈(0, 1], β ∈[0, 1) and α + β ≤ 1 is called an Intuitionistic fuzzy point in X.

III.INTUITIONISTIC FUZZY GENERALIZED ALPHA SUPRA CONTINUOUS MAPPINGS

In this section we introduce Intuitionistic fuzzy generalized alpha supra continuous mapping and studied some of its properties.

Definition 3.1:

A mapping f: (X, τ_μ)→(Y,σ_μ) is called an Intuitionistic fuzzy generalized alpha supra continuous (IFGα supra continuous in short) mapping if f^{-1}(B)is an IFGαSC(X) in (X, τ_μ) for every IFSCS B of (Y,σ_μ).

Example 3.2:

Let us consider X= {a, b},Y= {u, v} and A= ⟨x, (0.3,0.3), (0.7,0.6)⟩,B= ⟨x, (0.2,0.2), (0.8,0.7)⟩, U = ⟨y, (0.7,0.6), (0.3,0.4)⟩ , V=⟨y, (0.6,0.5), (0.4,0.5)⟩ Then τ_μ={0~, A, B, A∪B 1~} and σ_μ={0~,U, V,U∪V,1~} are IFSTS on X and Y respectively. Define a mapping f: (X, τ_μ)→(Y,σ_μ) by f(a)=u and f(b)=v. Then f is an IFGα supra continuous mapping.

Theorem 3.3:

Every IF supra continuous mapping is an IFGα supra continuous mapping but not conversely.

Proof:

Let f: (X, τ_μ)→(Y,σ_μ) be an IF supra continuous mapping. Let A be an IFSCS in Y. Since f is IF supra continuous mapping, f^{-1}(A)is an IFSCS in X. Since every IFSCS is an IFGαSCS ,f^{-1}(A)is an IFGαSCS in X. Hence f is an IFGα supra continuous mapping.

Example 3.4:

Let us define X = {a, b}, Y = {u, v} and
A= ⟨x, (0.2,0.3), (0.8,0.7)⟩,B= ⟨x, (0.1,0.2), (0.9,0.8)⟩,
U= ⟨y, (0.4,0.4), (0.6,0.6)⟩, V = ⟨y, (0.3,0.3), (0.7,0.7)⟩.
Then τ_μ= {0~,A,B,A∪B,1~} and σ_μ={0~,U, V,U∪V,1~} are IFSTS on X and Y respectively.
Define a mapping f: (X, τ_μ)→(Y,σ_μ) by f(a) = u and f(b) = v. Then f is an IFGα supra continuous mapping but not IF supra continuous mapping, since U^C=⟨x, (0.6,0.6), (0.4,0.4)⟩is an IFSCS in Y, but $f^{-1}(U^C)$ is not an IFSCS in X.

Theorem 3.5:

Every IFα supra continuous mapping is an IFGα supra continuous mapping but not conversely.

Proof:

Let f:(X,τ_μ)→(Y,σ_μ) be an IFGα supra continuous mapping. Let A be an IFSCS in Y. Since f is IFGα supra continuous mapping, f^{-1}(A) is an IFαSCS in X. Since every IFαSCS is an IFGαSCS, f^{-1}(A)is an IFGαSCS in X. Hence f is an IFGα supra continuous mapping.

Example 3.6:

Let us consider X = {a, b}, Y = {u, v}and A=⟨x, (0.2,0.3), (0.7,0.6)⟩, B=⟨x, (0.1,0.2), (0.8,0.7)⟩,U= ⟨y, (0.3,0.3), (0.5,0.6)⟩ V=⟨y, (0.2,0.2), (0.6,0.7)⟩.,Then τ_μ= {0~, A, B, A∪B ,1~} and σ_μ={0~,U, V,U∪V, 1~} are IFSTS Then f is an IFGα supra continuous mapping but not IFα supra continuous mapping, since U^C=⟨x, (0.5,0.6), (0.3,0.3)⟩ is an IFSCS in Y, but $f^{-1}(U^C)$ is not IFαSCS in X.

Theorem 3.7:

If f: (X, τ_μ)→ (Y,σ_μ) is IFGα-supra continuous mapping then for each Intuitionistic fuzzy point c(α,β) of X and each IFSOS V of Y such that *f*(c(α, β)) ⊆V, there exists an IFGα-supra open set U of X such that c(α, β) ⊆U and f(U)⊆V.

Proof:

Let c(α, β) be Intuitionistic fuzzy point of X and V be an IFSOS of Y such that f(c(α, β)) ⊆V. Put U = f^{-1}(V). Then by hypothesis U is an IFGα- supra open set of X such that c(α, β)⊆U and f(U) = f (f^{-1}(V))⊆V.

Theorem 3.8:

If f: (X, τ_μ)→(Y,σ_μ) is an IFGα- supra continuous mapping then for each Intuitionistic fuzzy point c(α,β) of X and each IFSOS V of Y such that *f*(c(α,β))qV, there exists an IFGα-supra open set U of X such that c(α,β) q U and f(U) ⊆V.

Proof:

Let c(α,β) be Intuitionistic fuzzy point of X and V be an IFSOS of Y such that f(c(α,β)) q V. Put U = f^{-1}(V). Then by hypothesis U is an IFGα- supra open set of X suchthat c(α,β)q U and f(U) = f(f^{-1}(V))⊆V.

Theorem 3.9:

Let f: (X, τ_μ)→ (Y,σ_μ) be a mapping from an IFSTS X into an IFSTS Y.Then the following are equivalent

(i)If X is an IF$\alpha_k T_{1/2}$space.

(ii)If is an IFGα supra continuous mappingf^{-1}(B) is an IFGαSCS in X for every IFSCS B in Y.

(iii)S-cl(S-int(S-cl(f^{-1}(B))⊆f^{-1}(S-cl(B))for every IFS B in Y.

Proof:

(i)⟹(ii) : is obviously true.

(ii)⟹(iii) : Let B be an IFS in Y. Then S-cl(B) is an IFSCS in Y. By hypothesis
f^{-1}(S-cl(B)) is an IFGαSCS in X. Since X is an IF$\alpha_k T_{1/2}$space,f^{-1}(S-cl(B)) is an IFSCS in X. Therefore S-cl(f^{-1}S-cl(B)) = f^{-1}(S-cl(B)). Now we have S-cl(S-int(S-cl(f^{-1}(B)))) ⊆S-cl(S-int(S-cl(f^{-1}(S-cl(B))))⊆f^{-1}(S-cl(B)).

(iii)⟹(i): Let B be an IFSCS in Y. By hypothesis S-cl(S-int(S-cl(f^{-1}(B))))⊆f^{-1}(S-cl(B))=f^{-1}(B). This implies f^{-1}(B) is

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an IFαSCS in X and hence $f^{-1}(B)$is an IFGαSCS in X. Therefore f is an IFGα supra continuous mapping.

Theorem 3.10:

A mapping f: $(X, \tau_\mu) \rightarrow (Y,\sigma_\mu)$ is IFGα supra continuous mapping if and only if the inverse image of each IFSOS in Y is an IFGαSOS in X.

Proof:

Let A be an IFSOS in Y. This implies A^C is an IFSCS in Y. Since f is an IFGαSCS in X. $f^{-1}(A^C) = \overline{f^{-1}}(A)$,$f^{-1}(A)$ is an IFGαSOS in X.

Theorem 3.11:

Let f: $(X, \tau_\mu) \rightarrow (Y, \sigma_\mu)$ be a mapping and let f (A) is an IFRSCS in X for every IFSCS A in Y. Then f is an IFGα supra continuous mapping.

Proof:

Let A be an IFSCS in Y. Then $f^{-1}(A)$is an IFRSCS in X. Since every IFRSCS is an IFGαSCS, $f^{-1}(A)$is an IFGαSCS in X. Hence f is an IFGα supra continuous mapping

Theorem 3.12:

Let f: $(X, \tau_\mu) \rightarrow (Y,\sigma_\mu)$ be a mapping from an IFSTS X into an IFSTS Y.Then the following are equivalent if X is an IF$\alpha_k T_{1/2}$space

(i) f is an IFGα supra continuous mapping

(ii) $f^{-1}(A)$is an IFGαSOS in X for every IFSOS A in Y.

(iii)$f^{-1}(S\text{-int}(A)) \subseteq S\text{-int}(S\text{-cl}(S\text{-int}(f^{-1}(A)))$for every IFS A in Y

Proof:

(i)⟹(ii) : is obviously true.

(ii)⟹(iii) : Let A be an IFS in Y. Then S-int(A) is an IFSOS in Y. By hypothesis $f^{-1}(S\text{-int}(A))$ is an IFGαSOS in X. Since X is an IF$\alpha_k T_{1/2}$space, $f^{-1}(S\text{-int}(A))$ is an IFSOS in X. Therefore $f^{-1}(S\text{-int}A) = S\text{-int}((f^{-1}(S\text{-int}(A)) \subseteq S\text{-int}((S\text{-cl}(S\text{-int}(f^{-1}(A))))$

(iii)⟹(i): Let A be an IFSCS in Y. Then its complement A^C is an IFSOS in Y. By hypothesis $f^{-1}(S\text{-int}A^C) \subseteq S\text{-int}((S\text{-cl}(S\text{-int}(f^{-1}(A^C)^C))$.Hence $f^{-1}(A^C)$ is an IFαOS in X. Since every IFαSOS is an IFGαSOS, $f^{-1}(A^C)$ is an IFGαSOS in X. Hence f is an IFGα supra continuous mapping.

Theorem 3.13:

Let f: $(X, \tau_\mu) \rightarrow (Y,\sigma_\mu)$ be an IFGα supra continuous mapping, then f is an IF supra continuous mapping if X is an IF$\alpha_k T_{1/2}$space.

Proof:

Let A be an IFSCS in Y. Then $f^{-1}(A)$is an IFGαSCS in X, by hypothesis. Since X is an IF$\alpha_k T_{1/2}$space, $f^{-1}(A)$is an IFSCS in X. Hence f is an IF supra continuous mapping.

Theorem 3.14:

Let f: $(X, \tau_\mu) \rightarrow (Y,\sigma_\mu)$ be an IFGα supra continuous mapping and g: $(Y, \sigma_\mu) \rightarrow (Z, \rho_\mu)$ is IF supra continuous mapping then $g \circ f:(X, \tau_\mu) \rightarrow (Z, \rho_\mu)$ is IFGα supra continuous mapping.

Proof:

Let A be an IFSCS in Z. Then $g^{-1}(A)$ is an IFSCS in Y, by hypothesis. Since f is an IFGα supra continuous mapping, $f^{-1}(g^{-1}(A))$ is an IFGαSCS in X. Since X is an IF$\alpha_k T_{1/2}$ space,$f^{-1}(g^{-1}(A))^{-1}$is an IFSCS in X. Since we know that $(g \circ f)^{-1}(A) = f^{-1}(g^{-1}(A))$ and hence g∘f is an IFGα supra continuous mapping.

Definition 3.15:

Let (X, τ_μ) be an IFSTS. The generalized α supra closure (IFGαS-cl(A) in short) for any IFS A is defined as follows.

IFGαS-cl(A) = ∩ {K ⁄ K is an IFGαSCS in X and A⊆ K}

.If A is an IFGαSCS, then IFGαS-cl(A) = A.

Remark:

It is clear that A ⊆IFGαS-cl(A) ⊆S-cl (A)

Theorem 3.16:

Let f: $(X, \tau_\mu) \rightarrow (Y,\sigma_\mu)$ be an IFGα supra continuous mapping. Then the following statements hold. f(IFGαS-cl(A)) ⊆S-cl(f(A), for every IFS A in X. IFGαS-cl($f^{-1}(B)$) ⊆f^{-1}(S-cl(B)), for every IFS B in X.

Proof :

(i) Let A⊆X. Then S-cl(f(A)) is an IFSCS in Y. Since f is an IFGα supra continuous mapping, f^{-1}(S-cl(f(A))) is an IFGαSCS in X.(That is IFGαS-cl(A) ⊆f^{-1}(S-cl(f(A))).Since A ⊆f^{-1}(f(A)) ⊆f^{-1}(S-cl(f(A))) and f^{-1}(S-cl(f(A))) is an IFGα supra closed,implies IFGαS-cl(A) ⊆f^{-1}(S-cl(f(A))). Hence f [IFGαS-cl(A)] ⊆S-cl(f(A)).(ii) Replacing A by f^{-1}(B) in (i), we get f(gαS-cl(f^{-1}(B)) ⊆S-cl(f(f^{-1}(B)) ⊆S-cl(B).Hence IFGαS-cl(f^{-1}(B)) ⊆f^{-1}(S-cl(B)), for every IFS B in Y.

Theorem 3.17:

Let f: $(X, \tau_\mu) \rightarrow (Y,\sigma_\mu)$ be a mapping from an IFSTS X into an IFSTS Y. If X is an IFG$\alpha_l T_{1/2}$space then f is IFGα-continuous supra mapping if and only if it is IFGα supra continuous mapping.

Proof :

Let f be an IFGα supra continuous mapping and let A be an IFSCS in Y. Then by definition, $f^{-1}(A)$is an IFGαSCS in X. Since X is an IFG$\alpha_l T_{1/2}$space, $f^{-1}(A)$is an IFαSCS in X. Hence f is IFαS continuous mapping. Conversely assume that f is IFα supra continuous mapping by theorem 3.5, f is an IFGα- supra continuous mapping.

Theorem 3.18:

Let f: $(X, \tau_\mu) \rightarrow (Y,\sigma_\mu)$ be a mapping from an IFSTS X into an IFSTS Y.Then the following statements are equivalent

(i) f is an IFGα supra continuous mapping

(ii) For each IFP∈P(α,β)and every IFN A of f(P(α,β)), there exist an IFGαSCS B such that (α,β)∈B⊆f^{-1}(A).

(iii) For each IF P(α,β)∈ X and every IFN A of f(P(α,β)), there exist an IF GαSCS B such that (α,β)∈Band f(B)⊆A.

Proof:

(i)⟹(ii) : Assume that f is an IFGα supra continuous mapping. Let (α,β)be an IFP in X and A be an IFN of f(P(α,β)). Then by definition of IFN, there exists an IFSCS C in Y, such that f(P(α,β))∈C ⊆A. Taking B = f^{-1}(C)∈X, Since f is an IFGα supra continuous mapping, f^{-1}(C) is IFGαSCS in X and (α,β)∈B⊆f^{-1}(f(P(α,β)))⊆f^{-1}(C) = B⊆f^{-1}(A).Hence (α,β)∈B⊆f^{-1}(A).

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(ii)⟹(iii) : Let P(α,β)be an IFP in X and A be an IFN of f(P(α,β)), such that there exists an IFGαSCS B with P(α,β)∈Band B⊆f^{-1}(A). This implies (B) ⊆A. Hence (iii) holds.

(iii)⟹(i) : Assume that (iii) holds. Let B be an IFSCS in Y and take (α,β)∈f^{-1}(B). Then f(P(α,β)) ∈B. Since B is an IFSCS in Y, B is an IFN of f(P(α,β)).Then from (iii) there exists an IFGαSCS A such that (α,β)∈A and f(A) ⊆B. Therefore (α,β)∈A⊆f(f^{-1}(A)) ⊆f^{-1}(B).That is (α,β)∈A⊆f^{-1}(B).Since (α,β)be an arbitrary point and f^{-1}(B)is union of all IFP contained in f^{-1}(B) , by assumption f^{-1}(B)is an IFGαSCS. Hence f is an IFGα supra continuous mapping.

IV.INTUITIONISTIC FUZZY GENERALIZED ALPHA SUPRA IRRESOLUTE MAPPINGS

In this section we introduce Intuitionistic fuzzy supra irresolute mappings and Intuitionistic fuzzy generalized alpha supra irresolute mappings and studied some of its properties.

Definition 4.1

Let f be a mapping from an IFSTS (X, τ_μ) into an IFSTS (Y,σ_μ).Then f is said to be Intuitionistic fuzzy supra irresolute (IF supra irresolute in short) f^{-1}(B)∈IFSCS(X) for every IFSCS B in Y.

Definition 4.2:

A mapping f: (X, τ_μ)→(Y,σ_μ) is called an Intuitionistic fuzzy generalized alpha supra irresolute (IFGα supra irresolute) mapping if f^{-1}(B)is an IFGαSCS in (X, τ_μ)for every IFGαSCS B of (Y, σ_μ).

Theorem 4.3:

Let f: X → Y be a mapping from an IFSTS X into an IFSTS Y. Then every IFGα-supra irresolute mapping is an IFGα supra continuous mapping

Proof:

Let A be an IFSCS in Y. We know that every IFSCS is an IFGαSCS. Therefore A is an IFGαSCS in Y. Since f is an IFGα supra irresolute mapping, by definition f^{-1}(A) is IFGαSCS in X. Hence f is an IFGα supra continuous mapping.

Theorem 4.4:

Let f: X → Y be a mapping from an IFSTS X into an IFSTS Y. Then the following statements are equivalent.

(i) f is an IFGα supra irresolute mapping

(ii) f^{-1}(B) is an IFGαSOS in X for every IFGαSOS B in Y.

(iii)IFGαS-cl(f^{-1}(B))⊆f^{-1}(IFGα(S-clB)),for every IFS B in Y.

(iv)f^{-1}(IFGα(S-intB))⊆IFGαS-int(f^{-1}(B),for every IFS B in Y.

Proof :

(i)⟹(ii) . It can be proved by taking the complement of definition 4.2.

(ii)⟹(iii): Let B be any IFS in Y. Then B⊆(B). Also f^{-1}(B) ⊆f^{-1}IFGα(S-cl(B)).Since IFg(S-cl(B)) is an IFGαSCS in Y, f^{-1}IFGα(S-cl(B)) is an IFGαSCS in X. Therefore IFGαS-cl (f^{-1}(B)⊆f^{-1}IFGα(S-cl(B)).

(iii)⟹(iv): Let B be any IFS in Y. Then S-int(B) is an IFSOS in Y. Then f^{-1}(S-int(B)) isan IFGαSOS in X. Since IFg(S-int(B)) is an IFGαSOS in X, f^{-1}(IFGα(S-int(B)) is an IFGαSOS in X. Therefore IFg(S-cl(B)) is an IFGαSCS in Y,f^{-1}(IFGα(S-cl(B))) is an IFGαSCS in X. Therefore IFGαS-cl(f (B)) ⊆f^{-1}(IFGα(S-clB)).

(iv)⟹(i): Let B be any IFGαSOS in Y. Then IFg(S-intB)= B. By our assumption we have f^{-1}(B) = f^{-1}(IFGα(S-intB) ⊆ IFGαintf^{-1}(B)), so f^{-1}(B)is an IFGαSOS in X. Hence f is an IFGα supra irresolute mapping.

Theorem 4.5:

Let f: X → Y be an IFGα-supra irresolute mapping, then f is an IF supra irresolute mapping if X is an IF$\alpha_k T_{1/2}$space.

Proof :

Let A be an IFSCS in Y. Then A is an IFGαSCS in Y. Therefore f^{-1}(A) is an IFGαSCS in X, by hypothesis. Since X is an IF$\alpha_k T_{1/2}$space, f^{-1}(A) is an IFSCS in X. Hence f is an IF -supra irresolute mapping.

Theorem 4.6:

Let f: X → Y be an IFGα -supra irresolute mapping, then f is an IFα supra irresolute mapping if (X,τ_μ) is an IF$\alpha_k T_{1/2}$space.

Proof :

Let B be an IFαSCS in Y. Then B is an IFGαSCS in Y. Since f is an IFGα –supra irresolute,f^{-1}(B) is an IFGαSCS in X,by hypothesis. Since X is an IF$\alpha_k T_{1/2}$space,f^{-1}(B) is an IFαSCS in X. Hence f is an IFα S-irresolute mapping.

Theorem 4.7:

Let f : (X, τ_μ) → (Y, σ_μ) and g : (Y, σ_μ) →(Z,ρ_μ) are IFGα supra irresolute mappings, where X,Y,Z are IFSTS . Then g∘f is an IFGα supra irresolute mapping.

Proof :

Let A be an IFGαSCS in Z. Since g is an IFGα supra irresolute mapping g^{-1}(A) is an IFGαSCS in Y. Also since f is an IFGα supra irresolute mapping ,f(g^{-1}(A)) is an IFGαSCS in X .$(g∘f)^{-1}$= f^{-1}(g^{-1}(A)) for each A in Z. Hence (g∘f)(A) is an IFGαSCS in X. Therefore g∘f is an IFGα supra irresolute mapping.

Theorem 4.8:

Let f : (X, τ_μ) → (Y, σ_μ) and g : (Y, σ_μ) →(Z,ρ_μ) are IFGα supra irresolute and IF supra continuous mappings respectively, where X,Y,Z are IFSTS . Then g∘f is an IFGα supra continuous mapping.

Proof :

Let A be any IFSCS in Z. Since g is an IF supra continuous mapping, g^{-1}(A) is an IFGα supra closed set in Y. Also since f is an IFGα supra irresolute mapping ,f^{-1}(g^{-1}(A)) is an IFGα- supra closed set in X .Since $(g∘f)^{-1}$= f^{-1}(g^{-1}(A)) is an IFGαSCS in X for each A in Z. Hence (g∘f)(A) is an IFGαSCS set in X. Therefore g∘f is an IFGα supra irresolute mapping.

IV.CONCLUSION

Many different forms of generalized closed sets have been introduced over the years. Various interesting problems arise when one considers openness. Its importance is

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significant in various areas of mathematics and related sciences, In this paper we introduced and studied about IFGα supra continuous mappings and IFGα supra irresolute mappings in Intuitionistic fuzzy supra topological spaces. This shall be extended in the future Research with some applications.

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