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A Relation between π Generalized Pre Connectedness and π Generalized Supra Connectedness In Intuitionistic Fuzzy Topological Space

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Abstract

The aim of this paper is to give the concepts of intuitionistic fuzzy **π** generalized pre connectedness with study its properties. Finally we study the relation between intuitionistic fuzzy **π** generalized pre connectedness and intuitionistic fuzzy **π** generalized supra connectedness in intuitionistic fuzzy topological space .

1. Introduction

In1965, the concept of " fuzzy set" was introduced by Zadeh in his classical paper [1]. Chang [2] introduced the concept of "fuzzy topological space" by using concept of fuzzy sets. After that, in 1986, Atanassov [3] introduced the " intuitionistic fuzzy sets" . in the 1997 Coker [4] defined the concept of "intuitionistic fuzzy topological spaces". Recently appeared many concepts of fuzzy topological such as fuzzy connectedness have been generalized in intuitionistic fuzzy topological spaces ,also S. Özça˘g and D. Çoker [5] introduced the π-generalized Semi Connectedness in "Intuitionistic Fuzzy Topological Spaces connectedness" .In this paper we introduce concept of intuitionistic fuzzy π generalized pre connectedness with it relation intuitionistic fuzzy π generalized supra connectedness and investigates some them properties .

2. Preliminaries

Definition 2.1: [3] Let $X \neq \emptyset$. An "intuitionistic fuzzy set" ("IFS" ,in short) M in X is an object having the form M= $\{\langle x , \sigma_M(x), \delta_M(x)\rangle : x \in X\}$ where the functions $\sigma_M(x) : X \longrightarrow [0,1]$ and $\delta_M(x) : X \longrightarrow [0,1]$ denote the degree of membership (namely " $\mu_A(x)$") and the degree of non-membership (namely "$\gamma_A(x)$") $\forall\, x \in X$ to the set M, respectively, and $0 \le \sigma_M(x) + \delta_M(x) \le 1$ $\forall\, x \in X$. Denote by "IFS(X)", the set of all "intuitionistic fuzzy sets" in X .

Definition 2.2: [7] Let M and N be "IFSs" of the form $M = \langle x, \sigma_M , \delta_M\rangle$ and $N = \langle x, \sigma_N , \delta_N\rangle$.Then

1- $M \subseteq N$ iff $\sigma_M(x) \le \sigma_N(x)$ and $\delta_M(x) \ge \delta_N(x)$ $\forall\, x \in X$.

2- $M = N$ iff $M \subseteq N$ and $N \subseteq M$.

3- $M^c = \{\langle x , \delta_M(x), \sigma_M(x)\rangle : x \in X\}$.

4- $M \cap N = \{\langle x , \sigma_M(x) \wedge \sigma_N(x), \delta_M(x) \vee \delta_N(x)\rangle : x \in X\}$.

5- $M \cup N = \{\langle x , \sigma_M(x) \vee \sigma_N(x), \delta_M(x) \wedge \delta_N(x)\rangle : x \in X\}$.

6- $\tilde{0} = \{\langle x ,0,1\rangle : x \in X\}$, $\tilde{1} = \{\langle x ,1,0\rangle : x \in X\}$.

we use this notation:

$M = \langle x, (\sigma_M , \sigma_N), (\delta_M , \delta_N) \rangle$ instead of $M = \langle x, (M/\sigma_M , N/\sigma_M), (M/\delta_M , N/\delta_N) \rangle$.

Definition 2.3: [3] Let $X \neq \emptyset$. An "intuitionistic fuzzy topology" ("IFT" , for short) on X is a collection ρ of "IFSs" in X with this conditions:

1) $\tilde{0}, \tilde{1} \in \rho$.

2) $j_1 \cap j_2 \in \rho$ for any $j_1 , j_2 \in \rho$.

3) $\cup j_i \in \rho$ for any arbitrary family $\{G_i : i \in J\} \subseteq \rho$. The pair (X,ρ) is called an "intuitionistic fuzzy topological space" ("IFTS" , for short) , any "IFS" in ρ is "intuitionistic fuzzy open set" ("IFOS" , for short) in X . The complement M^c of "IFOS M" in an "IFTS" (X,ρ) is called "intuitionistic fuzzy closed set" ("IFCS" , for short) in X .

Definition 2.4: [3] Let (X,ρ) be an "IFTS" and $M = \langle x, \sigma_M, \delta_M\rangle$ be "IFS" in X . Then :
$Int(M) = \cup \{ J : J \text{ is IFOSin } X, J \subseteq M \}$,
$Cl(M) = \cap \{ L : L \text{ is IFCSin } X, M \subseteq L \}$.

Definition 2.5: An "IFS" $M = \{\langle x, \rho_M(x), \delta_M(x)\rangle : x \in X\}$ in an "IFTS" (X,ρ) is said to be an

1) [4] "intuitionistic fuzzy semi closed set" ("IFSCS" , for short) if $Int(Cl(M)) \subseteq M$,
2) [4] "intuitionistic fuzzy α-closed set" ("IFαCS" , for short) if $Cl\left(Int(Cl(M))\right) \subseteq M$,
3) [4] "intuitionistic fuzzy pre-closed set" ("IFPCS" , for short) if $Cl(Int(M)) \subseteq M$,
4) [8] "intuitionistic fuzzy generalized closed set" ("IFGCS" , for short) if $Cl(M) \subseteq K$ whenever $M \subseteq K$ and K is an "IFOS" ,
5) [8] "intuitionistic fuzzy π open set" ("IFπGSCS" , for short) if $sCl(M) \subseteq K$,and K is "IFOβ" ,
6) [8] "intuitionistic fuzzy π open set" ("IFπGSCS" , for short) if $pCl(M) \subseteq K$,and K is "IFOβ" ,
7) [8] "intuitionistic fuzzy generalized semi closed set" ("IFπGSCS" , for short) if $sCl(M) \subseteq K$, whenever $M \subseteq K$ and K is an IFπOS ,
8) [8] "intuitionistic fuzzy generalized pre closed set" ("IFπGPCS", for short) if $pCl(M) \subseteq K$,whenever $M \subseteq K$ and K is an "IFπOP" .

Definition 2.6: [8] An "IFS" M is said to be an "intuitionistic fuzzy π − generalized semi open set" ("IFπGSOS" , for short) in X if M^c is "IFπGSCS" in X .The collection of "IFπGSCSs" of "IFTS" (X,ρ) is write by "IFπGSC(X)" .

Result 2.7:[8] Every "IFCS", "IFαCS", "IFGCS", "IFPCS", "IFαGCS" is an "IFπGSCS" but the reverse not true in generally.

Definition 2.8: [8] Let M be an "IFS" in an "IFTS" (X,ρ). Then "π-generalized semi closure" M ("πgscl(M)" , for short) and " π-generalized Semi interior" of M ("πgsint(M)" , for short) are :
$\pi gsInt(M) = \cup \{ J : J \text{ is "IF}\pi\text{GSOS" in } X, J \subseteq M \}$,
$\pi gscl(M) = \cap \{ L : L \text{ is "IF}\pi\text{GSCS" in } X, M \subseteq L \}$.

Definition 2.9: [3] Let a map $T: (M,\rho) \longrightarrow (N,\gamma)$. If $N = \{\langle w, \sigma_N(w), \delta_N(w)\rangle : w \in W\}$ is an "IFS" in W, then the image of N under T denoted by $T^{-1}(N)$, is the "IFS" in X defined by
$T^{-1}(N) = \{\langle r, T^{-1}(\sigma_N(r)), T^{-1}(\delta_N(r))\rangle : r \in R\}$. If $M = \{\langle r, \sigma_M(r), \delta_M(r)\rangle : r \in R\}$ is an "IFS" in M, then the image of M under T denoted by T(M) is "IFS" in W where ,
$T(M) = \{\langle w, T(\sigma_M(w)), \underset{\smile}{T}(\delta_N(w))\rangle : w \in W\}$ where $\underset{\smile}{T}(\delta_B(w)) = 1 - T(1 - \delta_N)$.

Definition 2.10: [8] A map $T: (X,\rho) \longrightarrow (Y,\gamma)$ is "intuitionistic fuzzy π generalized semi irresolute" ("IfπGSir ,for short) if $T^{-1}(N)$ is "IFπSGCS" in (X,ρ) ∀ "IFπGSCS" N of (Y,γ).

Definition 2.11: [8] A map $T: (X,\rho) \longrightarrow (Y,\gamma)$ is "intuitionistic fuzzy π generalized semi continuous" ("IFπGSC" , for short) if T(M) is "IFπSGOS" in (Y,γ) ∀ "IFπGSOS M " of (X,ρ) .

Definition 2.12: A map $T: (X,\rho) \longrightarrow (Y,\gamma)$ is
(a) [4] "intuitionistic fuzzy closed mapping" ("IFCM", for short) if T(M) is "IFCS" in Y ∀ "IFCS" A in X .
(b) [4] "intuitionistic fuzzy α −closed mapping" ("IfαCM" , for short) if T(M) is "IfαCS" in Y ∀ "IFCS" M in X .

Definition 2.13: [6] "IFTS" (X,ρ) is "IFπ$T_{1/2}$" space if every "IFRWGCS" in X is "IFCS" in X , where IFRWGCS is brief of Intuitionistic Fuzzy Regular Generalized Closed Set .

Definition 2.14: [6] "IFTS" (X,ρ) is "IF πg$T_{1/2}$" space if every "IFRWGCS" in X is "IFPCS" in X.

Definition 2.15:[5] "IFTS" (X,ρ) is said to be "intuitionistic fuzzy C_5 - connected space" if $\tilde{0}$ and $\tilde{1}$ are both "IFOS" and "IFCS" only .

Definition 2.16:[5] "IFTS" (X,ρ) is "intuitionistic fuzzy GO-connected space" if $\tilde{0}$ and $\tilde{1}$ are both "IFGOS" and "IFGCS" only .

Definition 2.17:[5] "IFTS" (X,ρ) is an "intuitionistic fuzzy C_5-connected" between "IFS" M , N if ∄"IFOS" Q in (X,ρ) s.t $M \subseteq Q$ and $Q \subseteq N^c$.

Definition 2.18: [5] "IFTS" (X,ρ) is "IFπGS connected space" if $\tilde{0}$ and $\tilde{1}$ are both IFπGSOS" and "IFπGSCS" only .

3. "Intuitionistic fuzzy π generalized pre connected spaces"

In this section, we have introduced "intuitionistic fuzzy π generalized pre connected" ("IFπGP connected" , for short) space and studied some of its properties .

Definition 3.1: An "intuitionistic fuzzy π − generalized pre open sets" ("IFπGPOS", for short)(resp. "pre closed sets" ("IFπGPCS" , for short) in (X,ρ) if its complement M^c is "IFπGPCS" in X (resp. if its complement M is "IFπGPOS" in (X,ρ)). The collection of "IFπGPOS" (resp. "IFπGPCS") of "IFTS" (X,ρ) is denoted by "IFπGPO(X)" (resp. "IFπGPC(X)") .

Definition 3.2: "IFTS" (X,ρ) is "IFπGP connected space" if $\tilde{0}$ and $\tilde{1}$ are both "IFπGPOS" and "IFπGPCS" only.

Example 3.3: Let $W = \{ m, n \}$ and $\rho = \{ \tilde{0}, K, \tilde{1} \}$ be "IFT" on X , where $K = \langle w, (0.3, 0.2), (0.4, 0.2)\rangle$. Then "IFTS" (X,ρ) is "IFπGP connected space " between the "IFS" $M = \langle w, (0.7, 0.1), (0.3, 0.3)\rangle$ and $N = \langle w, (0.1, 0.2), (0.5, 0.3)\rangle$

Proposition 3.4: Each "IFπGP connected space" is "IFC_5-connected space"

Proof: Let (X, ρ) is "IFπGP connected space". Suppose that (X, ρ) is not "intuitionistic fuzzy C_5- connected space", then ∃ "IFS A" which is both "intuitionistic fuzzy open" and "intuitionistic fuzzy closed" in (X, ρ). So M is "IFπGPOS" and "IFπGPCS" in (X, ρ) .Hence (X, ρ) is not an "IFπGP connected space". Thus we get a contradiction. Therefore (X, ρ) is "intuitionistic fuzzy C_5 −connected space" .

Remark 3.5: The converse of above proposition is not true . the example bellow shows the converse is not true .

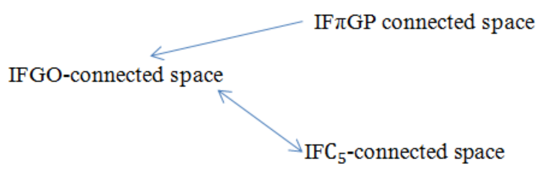
Example 3.6: Let $W = \{m, n\}$, $\rho = \{\tilde{0}, K, \tilde{1}\}$ be "IFT" on W , where $K = \langle w, (0.2, 0.2), (0.1, 0.8)\rangle$. Then (X, ρ) is "IFC_5-connected space" because the "intuitionistic fuzzy sets" $\tilde{0}$ and $\tilde{1}$ are both "IFOS" and "IFCS" , but not an "IFπGP connected space", since the "IFS K" in ρ is both an "IFπGPOS" and an "IFπGPCS" in (X, ρ) .

Proposition 3.7: Let (X, ρ) is an "IFTS". Then (X, ρ) is "GO-connected" iff ∀ "IFπGP connected space" .

Proof:⟹ Let (X, ρ) is "IFπGP connected space". suppose that (X, ρ) "IFGO-connected space" , let $\tilde{0}$ and $\tilde{1}$ are both "IFGOS" and IFGCS ((X, ρ) is an " IFGO-connected space") since "IFπGPOS" and "IFπGPCS" are $\tilde{0}$ and $\tilde{1}$. Hence(X, ρ) is "IFπGP connected space" .

⟸Suppose (X, ρ) is not an "IFGO −connected space" , then ∃ "IFS M" which is both "IFGOS" and "IFGCS" in (X, ρ) . So M is both "IFπGPOS" and "IFπGPCS" in (X, ρ) . Thus (X, ρ) is not "IFπGP connected space" . Hence ,we get a contradiction. Thus (X, ρ) is " IFGO −connected space" .

Remark 3.8: Let (X, ρ) is an "IFTS". The implications are valid :



Example 3.10: Let $W = \{ m, n \}$ and $\rho = \{ \tilde{0}, K, \tilde{1} \}$ be "IFT" on X , where $K = \langle w, (0.6, 0.1), (0.2, 0.2)\rangle$. Then "IFTS" (X, ρ) is IFC_5-connected space between the "IFS" $M = \langle w, (0.5, 0.4), (0.4, 0.5)\rangle$ and $N = \langle w, (0.7, 0.3), (0.2, 0.6)\rangle$, but it is not IFπGP connected space . Also (X, ρ) is IFGO-connected space but it is not IFπGP connected space.

Proposition 3.11: The "IFTS" (X, ρ) is "IFπGP connected space" iff ∃ no non-zero "IFπGPOS" M and N in (X, ρ) s.t $M = N^c$.

Proof: Let M and N be two "IFπGPOS" in (X, ρ) such that $M \neq \tilde{0}$, $N \neq \tilde{1}$ and $M = N^c$. Therefore N^c is an "IFπGPCS" . Since $M \neq \tilde{0}$ $N \neq \tilde{1}$. So that N is "IFS" which is both "IFπGPOS" and "IFπGPCS" in (X, ρ). Thus (X, ρ) is not "IFπGP connected space", but this a contradiction .
Hence ∃ no non-zero "IFπGPOS" M and N in (X, ρ) s.t $M = N^c$. Let M be both "IFπGPOS" and "IFπGPCS" in (X, ρ) such that $\tilde{0} \neq M \neq \tilde{1}$. Now let $N = M^c$. Then N is "IFπGPOS" and $B \neq 1\sim$. Hence $N^c = M \neq \tilde{0}$, and its contradiction . Therefore (X, ρ) is "IFπGP connected space" .

Proposition 3.12: Let (X, ρ) be "IFπ $T_{1/2}$ " space, then this implications are equivalent:
(i) (X, ρ) is "IFπGP connected space" .
(ii) (X, ρ) is "IFGO-connected space".
(iii) (X, ρ) is "IFC_5-connected space".

Proof: (i) ⟶ (ii): By using Proposition 3.8, we get the result .
(ii) ⟶ (iii): By using Remark 3.9, we get the result .
(iii) ⟶ (i): Let (X, ρ) be "IFC_5-connected space". Suppose (X, ρ) is not "IFπGP connected space", so ∃ "IFS M " in (X, ρ) which is both "IFπGPOS" and "IFπGPCS" in (X, ρ). But (X, ρ) is an "IFπa $T_{1/2}$ " space, M is both "IFO" and "IFC" in (X, ρ).Thus (X, ρ) not "IFC_5-connected", and its contradiction . Hence (X, ρ) must be an" IFπGP connected space" .

Definition 3.13: A map $T: (X, \rho) \longrightarrow (Y, \gamma)$ is "intuitionistic fuzzy π generalized pre irresolute" ("IFπGPir" , for brief) if $T^{-1}(N)$ is "IFπPGCS" in (X, ρ) ∀ "IFπGPCS N" of (Y, γ) .

Proposition 3.14: If $T: (X, \rho) \longrightarrow (Y, \gamma)$ is "IFπGP continuous" and (X, ρ) is an "IFπGP connected space", then(Y, γ) is " IFC5 connected space".

Proof: Let (X, ρ) be "IFπGP connected space". Suppose that (Y, γ) is not "intuitionistic fuzzy C_5-connected space", then ∃ "IFS M" which is both "IFO" and "IFC" in (Y, γ) . Since T is "IfπGP continuous mapping" , so $T^{-1}(M)$ is "IFπGPOS" and "IFπGPCS" in (X, ρ), but it is a contradiction.
Therefore (Y, γ) is IFC_5-connected space .

Proposition 3.15: If $T: (X, \rho) \longrightarrow (Y, \gamma)$ is "IFπGPir" and (X, ρ) is an "IFπGP connected space", then (Y, γ) is "IFπGP connected space" .

Proof: Suppose that (Y, γ) is not "IFπGP connected space", so ∃ "IFS M" s.t M is both "IFπGPOS" and "IFπGPCS" in (Y, γ) . Since T is "IFπGP irresolute mapping", $T^{-1}(M)$ is both "IFπGPOS" and "IFπGPCS" in (X, ρ), we get a contradiction. Therefore (Y, γ) is an "IFπGP connected space".

Definition 3.16: "IFTS" (X, ρ) is "IFπGP connected" between "IFS" M and N if ∄ "IFπGPOS K" in (X, ρ) s.t $M \subseteq K$ and $K \subseteq M^c$.

Example 3.17: Let $W = \{ m, n \}$ and $\rho = \{ \tilde{0}, K, \tilde{1} \}$ be "IFT" on X , where $K = \langle w, (0.3, 0.3), (0.4, 0.5)\rangle$. Then "IFTS" (X, ρ) is "IFπGP connected" between the "IFS"

$M = \langle w, (0.6, 0.2), (0.6, 0.4)\rangle$ and $N = \langle w, (0.6, 0.2), (0.3, 0.3)\rangle$ where $M^c = \langle w, (0.06, 0.4), (0.6, 0.2)\rangle$.

Proposition 3.18: An "IFTS" (X, ρ) is "IFπGP connected" between two "IFSs" M and N iff there is no "IFπGPOS" and "IFπGPCS K" in (X, ρ) s.t $M \subseteq K \subseteq N^c$.

Proof: Let (X, ρ) be "IFπGP connected" between M and N . Suppose that ∃ an "IFπGPOS" and "IFπGPCS K " in (X, ρ) s.t $M \subseteq K \subseteq N^c$, then $N \subseteq K^c$ and $M \subseteq K$. So (X, ρ) not "IFπGP connected" between M and N, , so we get a contradiction .

Therefore ∃ no "IFπGPOS" and an "IFπGPCS K" in (X, ρ) s.t $M \subseteq K \subseteq N^c$.

Conversely suppose that (X, ρ) is not "IFπGP connected" between M and N. So ∃ "IFπGPOS K" in (X, ρ) s.t $M \subseteq K$ and $K \subseteq N^c$. So that ∃ an "IFπGPOS K" in (X, ρ) s.t $M \subseteq K \subseteq N^c$, but we get a contradiction. Thus (X, ρ) is "IFπGP connected" between M and N .

Proposition 3.19: Let (X, ρ) be an "IFTS" and M and N be "IFS" in (X, ρ) . Then, $M \subseteq N$, iff X is an "IFπGP connected" between M and N.

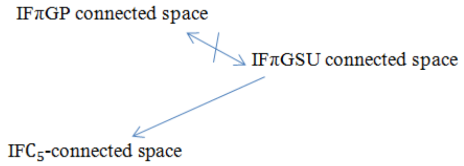
Proof: Suppose (X, ρ) is not "IFπGP connected" between M and N. Then ∃ an "IFπGPOS K" in (X, ρ) s.t $M \subseteq K$ and $K \subseteq N^c$. So that $M \subseteq N^c$,but we get a contradiction $(M \subseteq N)$. Therefore X is an "IFπGP connected" between M , N.

Conversely suppose (X, ρ) is an "IFπGP connected" between M , N.Thus M = N (by definition of "IFπGPOS connected") .Therefore, $M \subseteq N$.

4-The Relations between π Generalized Pre Connectedness and π Generalized supra connectedness in "IFTS"

Definition 4-1: An "intuitionistic fuzzy π −generalized supra open sets" ("IFπGSUOS", for short)(resp. "supra closed sets" ("IFπGSUCS", for short) in (X, ρ) if its complement M^c is "IFπGSUCS" in X (resp. if its complement M is "IFπGSUOS" in (X, ρ)). The collection of "IFπGSUOS" (resp. "IFπGSUCS") of "IFTS" (X, ρ) is denoted by "IFπGSUO(X)" (resp. "IFπGSUC(X)") .

Proposition 4.2: The relation among π Generalized Pre Connectedness and π Generalized supra connectedness of intuitionistic fuzzy connectedness is given in the following diagram.



Proof :

IFπGS connected space → IFC_5-connected space by definition of "IFC_5-connected space" and Remark 3.8 , we get the result .

Remark 4.3: By transitivity we get IFπGSU connected space → IFGO-connected space

Remark 4.4: The converse of above proposition are not true . the counter examples bellow shows the converse are not true .

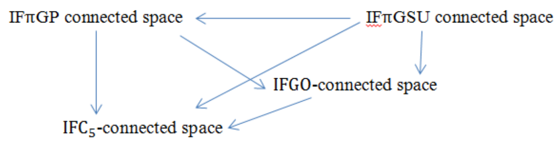
Example 4.5: Recall Example 3.6, we get (X, ρ) is an IFC5-connected space because the "IFS" $\tilde{0}$and $\tilde{1}$ are both "IFOS" and "IFCS" , but not an "IFπGP connected space" , because the "IFS K" in ρ is both an "IFπGPOS" and an "IFπGPCS" in (X, ρ) .

Example 4.6: Let $W = \{m, n, k\}$ and $\rho = \{\tilde{0}, K, \tilde{1}\}$ be "IFT" on W, where $M = \langle w, (0.7, 0.3), (0.5, 0.2), (0.2,0.7)\rangle$. Then (X, ρ) is an "IFπGP connected space" because the both "IFπGPOS" and "IFπGPCS" are $\tilde{0}$ and $\tilde{1}$, but not an "IFπGSU connected space", because the "IFS M" in ρ is not "IFπGSUOS" and "IFπGSUCS" in (X, ρ) .

Example 4.7: Let $W = \{m, n, k, h\}$ and $\rho = \{\tilde{0}, K, \tilde{1}\}$ be an "IFT" on W, where $K = \langle w, (0.6, 0.6), (0.3, 0.2), (0.3,0.5), (0.3.0.3)\rangle$. Then (X, ρ) is an "IFπGSU connected space" because the both "IFπGSUOS" and "IFπGSUCS" are $\tilde{0}$ and $\tilde{1}$, but not an "IFπGP connected space", because the "IFS K" in ρ is not an "IFπGPOS" and an "IFπGPCS" in (X, ρ) .

Example 4.8: Let $W = \{m, n, k, h\}$ and $\rho = \{\tilde{0}, K, \tilde{1}\}$ be "IFT" on W, where $K = \langle w, (0.1, 0.6), (0.2, 0.6), (0.3,0.3), (0.5.0.6)\rangle$. Then (X, ρ) is an "IFC_5-connected space" because the IFS $\tilde{0}$ and $\tilde{1}$ are both "IFOS" and "IFCS" , but not "IFπGS connected space", since the "IFS K" in ρ is not an "IFπGSUOS" and an "IFπGSUCS" in (X, ρ) .

Proposition 4.9: Let (X, ρ) be " $IF\pi T_{1/2}$ space" , then these relations are given as:



Proof: IFC_5-connected space → IFπGP connected space : its prove in Proposition 3.8.

IFπGP connected space → IFGO-connected space : By using Remark 3.8, and Proposition 4.2 , we get the result .

IFGO-connected space → IFC_5-connected space : By using Remark 3.8, and Proposition 4.2 , we get the result .

IFπGP connected space → IFC_5-connected space : its prove by transitivity .

IFπGSU connected space → IFGO-connected space : By using Proposition 4.2 we get the result .

IFπGSU connected space ⟶ IFπGP connected space

Suppose (X, ρ) be "IFπ $T_{1/2}$ " space and (X, ρ) is "IFπGSU connected space" so ∃ "IFGOS" and "IFGCS" are $\tilde{0}$ and $\tilde{1}$ in (X, ρ). Since $\tilde{0}$ and $\tilde{1}$ are both "IFGPOS" and "IFGSUCS" in (X, ρ) because (X, ρ) be an" IFπa $T_{1/2}$" .Thus (X, ρ) is "IFπGP connected space" .

Remark 4.10: The converse of above proposition are not true . The counter examples bellow shows the converse are not true .

Example 4.11: Let $W = \{m, n, k\}$ and $\rho = \rho = \{\tilde{0}, K, \tilde{1}\}$ be "IFT" on W, where $K = \langle x, (0.3, 0.7), (0.3, 0.5), (0.2, 0.1), (0.7.0.3)\rangle$. Then (X, ρ) is an "IFGO-connected" because the "IFS" $\tilde{0}$ and $\tilde{1}$ are both "IFOS" and "IFCS" , but not an "IFπGSU connected space", since the "IFS K" in ρ is not an "IFπGSUOS" and an "IFπGSUCS" in (X, ρ) . Also (X, ρ) is not an "IFπGP connected", since the "IFS K" in ρ is not an "IFπGPOS" and an "IFπGPCS" in (X, ρ) .

Example 4.12: Let $W = \{m, n, k\}$ and $\rho = \{\tilde{0}, K, \tilde{1}\}$ be "IFT" on W, where $K = \langle w, (0.5, 0.6), (0.4, 0.2), (0.5, 0.2), (0.3, 0.7)\rangle$. Then (X, ρ) is an "IFC_5-connected space" because the "IFS" $\tilde{0}$ and $\tilde{1}$ are both "IFOS" and "IFCS" , but not "IFGO-connected space" , because $\tilde{0}$ and $\tilde{1}$ are not "IFOS" and "IFCS" in (X, ρ) .

Example 4.13: Let $W = \{m, n, k, w\}$ and $\rho = \{\tilde{0}, K, \tilde{1}\}$ be an "IFT" on W, where $K = \langle w, (0.6, 0.4), (0.5, 0.1), (0.4, 0.3), (0.4, 0.6), (0.8, 0.2)\rangle$. Then (X, ρ) is "IFπGP connected space" because the "IFS" $\tilde{0}$ and $\tilde{1}$ are both "IFPOS" and "IFPCS" , but not "IFπGSU connected space", because $\tilde{0}$ and $\tilde{1}$ are not "IFSUOS" and "IFSUCS" in (X, ρ) .

Proposition 4.14: For any "IFTS" (X, ρ), we have every "IFOS", "IFSUOS", is an "IFπGPOS".

Proof: "IFOS" ⟶ "IFπGPOS" :

Suppose that (X, ρ) is "IFTS" and $M \subseteq X$. Since every "IFOS" is "IFPOS" also every "IFPOS" is "IFGPOS" in (X, ρ) , thus A^c is an "IFGPCS" in X ,so that N^c is an "IFπGPCS" in X . Thus (X, ρ) is "IFπGPCS" .

"IFSOS" ⟶ "IFπGPOS" : it's clear .

Remark 4.15: The converse of above Proposition is not true . the examples bellow shows the converse are not true .

Example 4.16: Let $W = \{m, n\}$ and $H = < x, (0.7, 0.1), (0.5, 0.7) >$ .Then $\rho = \{\tilde{0}, Q, \tilde{1}\}$ is "IFT" on W. Thus "IFS M" $= < w, (0.8, 0.2), (0.9, 0.6) >$ is "IFπGPOS" in (X, ρ) but not "IFOS" in W.

Example 4.17: Let $W = \{r, e\}$ and $S = < w, (0.1, 0.9), (0.9, 0.1) >$.Then $\rho = \{\tilde{0}, Q, \tilde{1}\}$ is "IFT" on W. So "IFS M" $= < w, (0.2, 0.1), (0.8, 0.2) >$ is "IFπGPOS" but not "IFOS" in W .

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العلاقة بين الترابط من النوع Pre – π والترابط من النوع Supra–π في الفضاءات التبولوجية المضببة الحدسية

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الملخص

ان الهدف من هذا البحث هو تقديم مفاهيم جديدة للترابط المعمم من النوع pre – π في الفضاء التبولوجي المضبب الحدسي ودراسة بعض خواصها. واخيرا درسنا العلاقة بين الترابط من النوع pre – π مع الترابط شبه المعمم من النوع semi–π في الفضاء التبولوجي المضبب الحدسي.