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Fuzzy Pairwise L-Open Sets and Fuzzy Pairwise L-Continuous Functions

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Abstract The aim of this paper is to introduce and study some new fuzzy pairwise notion in fuzzy bitopological ideals spaces. We also generalize the notion of fuzzy L-open sets due to Abd El-Monsef et al[1]. In addition to generalize the concept of fuzzy L-closed sets, fuzzy L-continuity and L-open functions due to Abd El-Monsef et al[1]. Relationships between the above new fuzzy pairwise notions and there other relevant classes are investigated. Recently, we define and study two different types of fuzzy pairwise functions.

Keywords Fuzzy Ideals, Fuzzy Bitopological Spaces, Fuzzy L-open Sets, Fuzzy L-continuous Functions

1. Introduction

The concept of fuzzy sets was first introduced by Zadeh[8].Subsequently, Chang defined the notion of fuzzy topology[4]. Since then various aspects of general topology were investigated and. carried out in fuzzy since by several authors of this field. The notions of fuzzy ideal and and fuzzy pairwes local function introduced and studied in[2]. Nouh[6] initiated the study of fuzzy bitopological spaces. A fuzzy set equipped with two fuzzy topologies is called a fuzzy bitopological space. Concepts of fuzzy ideals and fuzzy local function were introduced by Sarkar[7]. The purpose of this paper is to to introduce and study some new pairwise fuzzy notion in fuzzy bitopological ideals spaces. We also generalize the notion of fuzzy L-open sets due to Abd El-Monsef et al[1]. In addition to generalize the concept of L-closed sets, L-continuity and L-open functions due to Abd El-Monsef et al[1].

2. Preliminaries

Throughout this paper, by (X,τ_1,τ_2), we mean a fuzzy bitopological space (fbts in short) in Nouh's[6] sense. A fuzzy point in X with support $x\in X$ and value ε $0<\varepsilon\le 1$ is denoted by x_ε in[3]. A fuzzy point x_ε is said to be contained in a fuzzy set μ in I^X iff $\varepsilon\le\mu$ and this will be denoted by $x_\varepsilon\in\mu$ [3]. For a fuzzy set μ in a fbts (X,τ_1,τ_2), $\tau_i-cl(\mu)$, $\tau_i-Int(\mu)$, $i\in\{1,2\}$, and μ^c will respectively denote closure, interior and complement of μ. The constant fuzzy sets taking values 0 and 1 on X are denoted by o_x, 1_x respectively. A fuzzy set μ in fts is said to be quasi-coincident[5] with a fuzzy set η, denoted by $\mu\,q\,\eta$, if there exists $x\in X$ such that $\mu(x)+\eta(x)>1$. A fuzzy set ν in a fts (X,τ), is called a q-nbd[3,5] of a fuzzy point x_ε iff there exists a fuzzy open set μ such that $x_\varepsilon q\ \mu\subseteq\nu$, we will denoted the set of all q-nbd of x_ε in (X,τ) by $N(X,\tau)$. A nonempty collection of fuzzy sets L of a set X is called fuzzy ideal[5] on X iff i) $\mu\in L$ and $\eta\subseteq\mu\Rightarrow\mu\in L$ (heredity),(ii) $\mu\in L$ and $\eta\in L\Rightarrow\mu\vee\eta\in L$ (finite additivity). The fuzzy local function[7] $\mu^*(L,\tau)$ of a fuzzy set μ is the union of all fuzzy points x_ε such that if $\nu\in N(x_\varepsilon)$ and $\rho\in L$ then there is at least one $r\in X$ for which $\nu(r)+\mu(r)-1>\rho(r)$. For a fts (X, τ) with fuzzy ideal L, $cl^*(\mu)=\mu\vee\mu^*$[7] for any fuzzy set μ of X and $\tau^*(L)$ be the fuzzy topology generated by cl^*[7].

Definition.2.1.[2]. A fuzzy set μ in a fbts (X,τ_1,τ_2) is called pairwise quasi-coincident with a fuzzy set. η denoted by $P(\mu\,q\,\eta)$, if there exists $x\in X$ such that $\mu(x)+\eta(x)>1$. Obviously, for any two fuzzy sets μ and η, $P(\mu\,q\,\eta)$ will imply $P(\mu\,q\,\eta)$.

Definition.2.2.[2]. A fuzzy set μ in a fbts) is (X,τ_1,τ_2) called Pairwise quasi-neighborhood of point x_ε if and only if there exists a fuzzy τ_i-open, $i\in\{1,2\}$ set ρ

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such that $x_\in q\,\rho \subseteq \mu$ we will denote the set of all pairwise q-nbd of x_ε in (X,τ_1,τ_2) by $PN(x_\varepsilon,\tau_i)$,. $i\in\{1,2\}$

Definition 2.3.[2]. Let (X,τ_1,τ_2) be a fbts with fuzzy ideal L on X, and $\mu\in I^X$. Then the fuzzy pairwise local function $P\mu^*(L,\tau_i)$, $i\in\{1,2\}$ of μ is the union of all fuzzy points x_ε such that for $\rho\in PN(x_\varepsilon,\tau_i)$ and $\ell\in L$ then there is at least one $r\in X$ for which $\rho(r)+\mu(r)-1>\ell(r)$, where $PN(x_\varepsilon,\tau_i)$ is the set of all q-nbd of x_ε Therefore, any $x_\varepsilon\notin P\mu^*(L,\tau_i)$, $i\in\{1,2\}$ (for any $x_\varepsilon\notin\mu$ (any fuzzy set) implies hereafter, x_ε is not contained in the fuzzy set μ, i.e. $\varepsilon>\mu(x)$ implies there is at least one $\rho\in PN(x_\varepsilon,\tau_i)$ such that for every $r\in X$ for which $\rho(r)+\mu(r)-1>\ell(r)$ for some $\ell\in$ L.

We will occasionally write $P\mu^*$ or $P\mu^*(L)$ for $P\mu^*(L,\tau_i)$. We define P *-fuzzy closure operator, denoted by pcl* for fuzzy topology $\tau^*{}_i$(L) finer than τ_i as follows: $Pcl^*(\mu)=\mu\vee p\mu^*$ for every fuzzy set μ on X. When there is no ambiguity, we will simply write for $P\mu^*$ and $\tau_i{}^*$ for $P\mu^*(L,\tau_i)$. and $\tau_i{}^*(L)$, respectively.

Definition.2.4.[2]. Let (X,τ_1,τ_2) be a fbts with fuzzy ideal L on X, a fuzzy pairwise local function $P\mu^*(L,\tau_1\vee\tau_2)$, $i\in\{1,2\}$ of $\mu\in I^X$ is the union of all fuzzy points xε such that for and $\ell\in L$ then there is at least one $r\in X$ for which $\rho(r)+\mu(r)-1>\ell(r)$, where $PN(x_\varepsilon,\tau_i)$ is the set of all q-nbd of x_ε in $\tau_1\vee\tau_2$ (where $\tau_1\vee\tau_2$ is fuzzy topology generated by τ_1,τ_2.

Example: 2.1.[2]. One may easily verify that

If $L=\{0_x\}$ then $P\mu^*(L,\tau_i)=\tau_i-cl(\mu)$ for any $\mu\in I^X$, $i\in\{1,2\}$.

$L=I^X$, then $P\mu^*(L,\tau_i)=0_x$, for any $\mu\in I^X$, $i\in\{1,2\}$.

Theorem.2.1.[2]. Let (X,τ_1,τ_2) be a fbts with fuzzy ideal L on X, $\mu,\eta\in I^X$ and $\sigma=\tau_1\vee\tau_2$. Then we have:

i) $P\mu^*(L,\sigma)\subseteq P\mu^*(L,\tau_i)$; $i\in\{1,2\}$.

ii) If $\mu\subseteq\eta$ then $P\mu^*(L,\sigma)\subseteq P\eta^*(L,\tau_i)$; $i\in\{1,2\}$.

iii) $P\mu^*(L,\sigma)\subseteq\sigma-cl(\mu)\subseteq\tau_i-cl(\mu)$.

iv) $P\mu^{**}(L,\sigma)\subseteq P\mu\ (L,\tau_i)$; $i\in\{1,2\}$.

Theorem.2.2.[2]. Let (X,τ_1,τ_2) be a fbts with fuzzy ideal L on X, $\mu\in I^X$, If $\tau_1\subseteq\tau_2$, then

i) $P\mu^*(L,\tau_2)\subseteq P\mu^*(L,\tau_1)$, for every $\mu\in I^X$,

ii) $\tau_1^*\subseteq\tau_2^*$.

iii) Cleary $\tau_1^*\subseteq\tau_2^*$ as $P\mu^*(L,\tau_2)\subseteq P\mu^*(L,\tau_1)$

Theorem.2.3.[2]. Let (X,τ_1,τ_2) be a fbts and L,J be two fuzzy ideals on X. Then for any fuzzy sets $\mu,\rho\in I^X$

i.) $\mu\subseteq\rho\Rightarrow P\mu^*(L,\tau_i)\subseteq P\rho^*(L,\tau_i)$, $i\in\{1,2\}$.

ii.) $L\subseteq J\Rightarrow P\mu^*(J,\tau_i)\subseteq P\mu^*(L,\tau_i)$, $i\in\{1,2\}$

iii) $P\mu^*=\tau_i-cl(P\mu^*)\subseteq\tau_i-cl(\mu)$, $i\in\{1,2\}$.

vi) $P\mu^{**}(L,\tau_i)\subseteq P\mu^*(L,\tau_i)$ $i\in\{1,2\}$

v) $P(\mu\cup\rho)^*(L,\tau_i)=P\mu^*(L,\tau_i)\cup P\rho^*(L,\tau_i)$.

iv) $\rho\in L\Rightarrow P(\mu\cup\rho)^*(L,\tau_i)=P\mu^*(L,\tau_i)$

3. On Fuzzy Pairwise Local Function

Definition.3.1. Given (X,τ_1,τ_2) be a fbts with fuzzy ideal L on X, $\mu\in I^X$. Then μ is said to be:

i) Fuzzy pairwise $\tau^*{}_i$-closed, $i\in\{1,2\}$ (or PF-*closed) if $P\mu^*\le\mu$

ii) Fuzzy pairwise PL-dense – in – itself (or PF*-dense- in – itself) if $\mu\le P\mu^*$.

(iii) Fuzzy pairwise *-perfect if μ is PF*-closed and PF*-dense – in itself.

Theorem.3.1. Given (X,τ_i), $i\in\{1,2\}$ be a fbts with fuzzy ideal L on X, $\mu\in I^X$ then μ is

i) PF*- closed iff cl*(μ) = μ.

(ii) PF*- dense – in – itself iff cl*(μ)= p μ*.

(iii) PF*- perfect iff cl*(μ)= p μ*= μ.

Proof: Follows directly from the fuzzy pairwise closure operator cl* for a fuzzy bitopological $\tau^*{}_i(L)$, $i\in\{1,2\}$ in[2] and Definition 3.1

Remark 3.1. One can deduce that

(i) Every PF*-dense- in – itself is fuzzy pairwise dense set.

(ii) Every fuzzy pairwise closed (resp. fuzzy pairwise open) set is PF*-closed (resp. PF$\tau^*{}_i$ – open, $i\in\{1,2\}$).

Corollary.3.1. Given (X,τ_i), $i\in\{1,2\}$ be a fbts with fuzzy ideal L on X, $\mu\in\tau_i$ then we have :

(i) If μ is PF*-closed then p μ* ≤ int(μ) ≤ cl(μ).

(ii) If μ is PF*-dense- itself then int(μ)≤ p μ*.

(iii) If μ is PF*- perfect then int(μ) = cl(μ) = p μ*.

Proof: Obvious.

Theorem.3.1. Given (X,τ_i), $i\in\{1,2\}$ be a fbts with fuzzy ideal L_n on X, $\mu\in I^X$ then we have the following:

(i.) μ is fuzzy pairwise α - closed iff μ is PF*- closed.

(ii.) μ is fuzzy pairwise β – open iff μ is PF*- dense in itself.

(iii.) μ is fuzzy regular pairwise closed iff μ is PF*-perfect.

Proof: It's clear.

Corollary 3.2. For an fbts (X,τ_i), $i\in\{1,2\}$ with fuzzy ideal L on X, $\mu\in I^X$ the following holds:

(i) If $\mu\in PFC(X)$ then μ is PF*- closed.

(ii) If $\mu\in PF\beta C(X)$ then $\mathrm{int}(\mathrm{int}(P\mu*))\le\mu$.

(iii) If $\mu\in PFSC(X)$ then $\mathrm{int}(P\mu*)\le\mu$.

Proof: Obvious.

4. Fuzzy Pairwise L-open and Fuzzy Pairwise L- closed Sets

Definition.4.1. Given (X,τ_i), $i\in\{1,2\}$ be a fbts with fuzzy ideal L on X, $\mu\in I^X$ and μ is called a fuzzy pairwise L -open set iff there exists $\zeta\in\tau_i$, $i\in\{1,2\}$ such that $\mu\subseteq\zeta\subseteq P\mu^*(L,\tau_i)$ $i\in\{1,2\}$.

We will denote the family of all fuzzy pairwise L -open on (X,τ_i) $=\{\mu\in\tau_1-\mathrm{int}(P\mu^*(L,\tau_1)\}$ and $\mu\in\tau_2-\mathrm{int}(P\mu^*(L,\tau_2))$, $i\in\{1,2\}$.(simplify $FPLO(X)$).

When there is no chance for confusion.

Theorem.4.1. let (X,τ_i), $i\in\{1,2\}$ be a fbts with fuzzy ideal L then $\mu\in FPOL(X)$ iff $\mu\in\tau_i-\mathrm{int}(P\mu^*(L,\tau_i))$ for $i\in\{1,2\}$

Proof. Assume that $\mu\in FPOL(X)$ then Definition.4.1. there exists $\zeta\in\tau_i$, such that $\mu\subseteq\zeta\subseteq P\mu^*(L,\tau_i)$, $i\in\{1,2\}$. But $\mathrm{int}(P\mu^*)\subseteq P\mu^*$, put $\zeta=\mathrm{int}(P\mu^*)$. Hence $\mu\subseteq\mathrm{int}(P\mu^*)=P\mu^*$. Conversely $\mu\subseteq\mathrm{int}(P\mu^*)\subseteq P\mu^*$. Then there exists $\zeta\subseteq\mathrm{int}(P\mu^*)\in\tau_i$. Hence $\mu\in FPOL(X)$.

Definition.4.2. The largest $\tau_i-FPL-open$ (simply $\tau_i-FPLO(X)$) set contained in μ is called a $\tau_i-FPL-\mathrm{int}\,erior$ of μ. The complement of fuzzy pairwise L-open subset of X is a fuzzy pairwise L-closed subset of X (simply FPLC(X)). We denoted by FPL-$\mathrm{int}(\mu)$.

Theorem.4.2. Let (X,τ_i), $i\in\{1,2\}$ be a fbts with fuzzy ideal L, $\mu\in I^X$ and J is an arbitrary set then

i) The union of fuzzy pairwise L-open subsets is fuzzy pairwise L-open.

ii) If ν is fuzzy pairwise open and μ is fuzzy pairwise L-open subset of X. Then $\mu\cap\nu$ pairwise L-open subset.

Proof.

i) Let $\{\mu_j : j\in J\}$ be a family of FPLO(X). Then for each $j\in J$, $\mu_j\subseteq\tau_i-\mathrm{int}(p\mu^*{}_i)$ and so $\Upsilon_j\mu_j\subseteq\Upsilon_j\tau_i-\mathrm{int}\left(p\mu^*{}_i\right)\subseteq\tau_i-\mathrm{int}(\Upsilon_j p\mu^*{}_i)^*$.

ii) Assume that ν is fuzzy pairwise open and μ is fuzzy pairwise L-open subsets of X. Then $\mu\cap\nu\subseteq\nu\cap\left(\tau_i-\mathrm{int}(p\mu^*)\right)\subseteq\tau_i-\mathrm{int}(\nu\cap p\mu^*)\subseteq\tau_i-\mathrm{int}p(\nu\cap\mu)^*$.

Definition.4.3. Let $(X,\tau_i), i\in\{1,2\}$ be a fbts with fuzzy ideal L on X, $\mu\in I^X$. Then μ is said to be

i) fuzzy $\tau^*{}_i$ - closed iff $\tau^*{}_i-cl^*(\mu)=\mu$.

ii) fuzzy $\tau^*{}_i-dense-in-itself$ if $\mu\subseteq p\mu^*(L,\tau_i)$.

iii) fuzzy $\tau^*-perfect$ if μ is $\tau_1{}^*-closed$ and $\tau_1{}^*$ -dense in itself.

Theorem.4.3. Given $(X,\tau_i), i\in\{1,2\}$ a fbts with fuzzy ideal L on X, $\mu\in I^X$, then the following holds:

(i) If μ is both fuzzy pairwise L-open and $\tau^*{}_i$ -perfect then μ is fuzzy pairwise open.

(ii) If μ is both fuzzy pairwise open and $\tau^*{}_i$ dense –in – itself then μ is fuzzy pairwise L-open.

Proof. Follows directly from the fuzzy closure operator for $\tau^*{}_i$ and Definition.4.1

Corollary.4.1. For a fuzzy subset μ of a fbts (X,τ_i), $i\in\{1,2\}$ with fuzzy ideal L on X, we have:

If μ is $\tau_1{}^*-closed$ and $FPL-open$ then $\mathrm{int}(\mu)=\mathrm{int}(P\mu^*)$.

If μ is $\tau_1{}^*-perfct$ and $FPL-open$ set then $\mathrm{int}(\mu)=\mathrm{int}(P\mu^*)$.

Theorem.4.4. If $(X,\tau_i), i\in\{1,2\}$ a fbts with fuzzy ideal L and $\mu\in I^X$ then

(i) $\mu\cap\mathrm{int}(P\mu^*)$ is fuzzy L-open set.

(ii) FPL $\tau_i-\mathrm{int}(\mu)=0_X$ iff $\mathrm{int}(P\mu^*)=0_X$.

Proof.

(i)Since $\mathrm{int}(P\mu^*)=P\mu^*\cap\mathrm{int}(P\mu^*)$ then $\mathrm{int}(P\mu^*)=P\mu^*\cap\mathrm{int}(P\mu^*)\subseteq P(\mu\cap\mu^*)^*$ Thus $\mu\cap P\mu^*\subseteq(\mu\cap(\mu\cap\mathrm{int}\,P(P\mu^*))^*\subseteq\mathrm{int}\,P(\mu\cap\mathrm{int}\,P(P\mu^*)^*$. Hence $\mu\cap\mathrm{int}(P\mu^*)\in FPLO(X)$.

(ii) Let) FPL $\tau_i-\mathrm{int}(\mu)=0_X$. Then $\mu\cap(P\mu^*)=0_X$, implies $cl(\mu\cap\mathrm{int}(P\mu^*)=0_X$ and so $\mu\cap\mathrm{int}(P\mu^*)=0_X$ conversely assume that $\mathrm{int}(P\mu^*)=0_X$ then $\mu\cap\mathrm{int}(P\mu^*)=0_X$. Hence $FPL\tau_i-\mathrm{int}(\mu)=0_X$.

Theorem.4.5. If (X,τ_i), $i\in\{1,2\}$ a fbts with fuzzy ideal L on X, $\mu\in I^X$ then $FPL\tau_i-\mathrm{int}(\mu)=\mu\wedge\mathrm{int}(P\mu^*)$.

Proof. Clear

Definition.4.4: Given (X,τ_i), $i\in\{1,2\}$ a fbts with fuzzy ideal L and $\zeta\in I^X$, ζ called fuzzy pairwise L-closed set if its complement is fuzzy L-open set. We will denote the family of fuzzy L-closed sets by FPLC(X).

Theorem.4.6. Given (X,τ_i), $i\in\{1,2\}$ a fbts with fuzzy ideal L and $\zeta\in I^X$ is fuzzy pairwise L-closed set, then $P(\mathrm{int}\,\zeta)^*\le\zeta$.

Proof. It's clear.

Theorem.4.7. Given (X,τ_i), $i\in\{1,2\}$ be a fbts with fuzzy ideal L on X and $\zeta\in I^X$ such that $P(\text{int}\,\zeta)^{*c}=\text{int}\,P(\zeta^{c^*})$. then $\zeta\in FPLC(X)$ iff $P(\text{int}\,\zeta)^*\le\zeta$

Proof. (Necessity). Follows immedially from the above theorem. (Sufficiency). Let $P(\text{int}\,\zeta)^*\le\zeta$ then $\zeta^c\le(P\,\text{int}\,\zeta)^{*c}=\text{int}\,\zeta^{c*}$ from the hypothesis. Hence $\zeta^c\in FPLO(X)$. Thus $\zeta\in FPLC(X)$.

Corollary.4.2. For a fbts (X,τ_i), $i\in\{1,2\}$ with fuzzy ideal L on X , then the union of fuzzy pairwise L-closed sets is fuzzy pairwise L-closed set.

5. Fuzzy Pairwise L-Continuous Functions

By utilizing the notion of pairwise L-open sets, we establish in this article a class of fuzzy pairwise L-continuous function. Each of fuzzy pairwise L-continuous and fuzzy pairwise continuous function are independent concepts. Many characterizations and properties of this concept are investigated.

Definition.5.1.A fuzzy pairwise function f : $(X,\tau_i)\longrightarrow(Y,\sigma), i\in\{1,2\}$ with fuzzy ideal L on X is said to be fuzzy pairwise L-continuous if for every $\zeta\in\sigma$, $f^{-1}(\zeta)\in FPLO(X)$.

Remark.5.1: Every fuzzy pairwise L-continuity is fuzzy pairwise precontinuity but the converse is not true in general as seen by the following example.

Example.5.1: Let $X=Y=\{x\}$, fuzzy pairwise indiscrete bitopological , σ is fuzzy pairwise discrete bitopological and L= $\{0_X,\mu\}\vee\{x_\varepsilon:\varepsilon\le 0.3\}$ $\mu(x)=0.3$. The fuzzy pairwise identity function $f:(X,\tau_i)\longrightarrow(Y,\sigma), i\in\{1,2\}$ is fuzzy pairwise precontinuous but not fuzzy pairwise L-continuous, since $\mu\in\sigma$ while $f^{-1}(\mu)\notin FPLO(X)$.

Theorem.5.1: For a function $f:(X,\tau_i)\longrightarrow(Y,\sigma), i\in\{1,2\}$ with fuzzy ideal L on X the following are equivalent:

(i.) f is fuzzy pairwise L-continuous.

(ii.) For x_ε in X and each $\zeta\in\sigma$ containing $f(x_\varepsilon)$ there exists $\mu\in FPLO(X)$ containing x_ε such that $f(\mu)\le\sigma$.

(iii.) For each fuzzy pairwise point x_ε in X and $\zeta\in\sigma$ containing $f(x_\varepsilon)$, $(f^{-1}(\zeta))^*$ is fuzzy pairwise nbd of x_ε.

(iv.) The inverse image of each fuzzy pairwise closed set in Y is fuzzy pairwiseL-closed.

Proof: (i.)$\longrightarrow$(ii.). Since $\zeta\in\sigma$ containing, $f(x_\varepsilon)$ then by (i), $f^{-1}(\zeta)\in FPLO(X)$, by putting $\mu=f^{-1}(\zeta)$ which containing x_ε, we have $f(\mu)\le\sigma$ (ii.)$\longrightarrow$(iii.). Let $\zeta\in\sigma$ containing $f(x_\varepsilon)$. Then by (ii) there exists $\mu\in PLO(X)$ containing x_ε such that $f(\mu)\le\sigma$ so $x_\varepsilon\in\mu\le\text{int}\,\mu^*\le\text{int}(f^{-1}(\zeta))^*\le(f^{-1}(\zeta))^*$. Hence $(f^{-1}(\zeta))^*$ is fuzzy npbd of x_ε.

(iii.)$\rightarrow$(i.) Let$\zeta\in\sigma$, since $(f^{-1}(\zeta))$ is fuzzy pairwise npbd of any point$f^{-1}(\zeta)$, every point $x_\varepsilon\in(f^{-1}(\zeta))^*$ is a fuzzy pairwise interior point of $f^{-1}(\zeta)^*$. Then $f^{-1}(\zeta)\le\text{int}(f^{-1}(\zeta))^*$ and hence f is fuzzy pairwise L-continuous.

(i.) $\rightarrow$(iv.) Let $\zeta\in y$ be a fuzzy pairwise closed set. Then ζ^c is fuzzy pairwise open set, by $f^{-1}(\zeta^c)=f^{-1}(\zeta)^c\in FPLO(X)$. Thus $f^{-1}(\zeta)$ is fuzzy PL-closed set.

The following theorem establish the relationship between fuzzy pairwise L-continuous and fuzzy pairwise continuous by using the previous fuzzy pairwise notions.

Theorem.5.2. Given $f:(X,\tau_i)\longrightarrow(Y,\sigma), i\in\{1,2\}$ is a function with ideal L on X then we have. If f is fuzzy pairwise L-continuous of each fuzzy pairwise*-perfect set in X, then f is fuzzy pairwise continuous.

Proof: Obvious.

Corollary.5.1. Given a function f : $(X,\tau_i)\longrightarrow(Y,\sigma), i\in\{1,2\}$ and each member of X is fuzzy pairwise*-dense-in-itself.

Then we have:

(i.) Every fuzzy pairwise continuous function is fuzzy pairwise L-continuous.

(ii.) Each of fuzzy pairwise precontinuous function and fuzzy pairwise L-continuous are equivalent.

Proof: It's clear.

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