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Other Note on Paraconsistent Neutrosophic Sets

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Abstract. In an early paper, we prove that a Smarandache's definition of neutrosophic paraconsistent topology is neither a generalization of Çoker's intuitionistic fuzzy topology nor a Smarandache's general neutrosophic topology. Recently, Salama and Alblowi have given a new definition of neutrosophic topology, that generalizes Çoker's intuitionistic fuzzy topology. Here, we study this new definition and its relation with Smarandache's paraconsistent neutrosophic sets

INTRODUCTION

In various papers, Smarandache [10] [11] generalizes Atanassov's intuitionistic fuzzy sets [1] to neutrosophic sets.

Çoker [4] defined and studied intuitionistic fuzzy topological spaces.

On the other hand, various authors Priest et al.[8] worked on *paraconsistent logic*, that is, logics where some contradiction is admisible. We remark [3], [5] and [7]. And also *paraconsistent fuzzy logic* [2].

Smarandache [10],[11] defined also the neutrosophic paraconsistent sets, and he proposed a natural definition of neutrosophic paraconsistent topology.

I an early paper [6] we proved that this Smarandache's definition of neutrosophic paraconsistent topology is neither a generalization of Çoker's intuitionistic fuzzy topology nor a Smarandache's general neutrosophic topology.

Recently, Salama and Alblowi [9] have given a new definition of neutrosophic topology, that generalizes Çoker's intuitionistic fuzzy topology.

In this paper, we study this new definition and its relation with Smarandache's paraconsistent neutrosophic sets.

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BASIC DEFINITIONS

First, we present some basic definitions:

Definition 1. [11] Let ***T,I,F*** be real standard or non-standard subsets of the non-standard unit interval $]^{-}0,1^{+}[$, with

$\sup T = t_{sup\_}$, $\inf T = t_{inf}$

$\sup I = i_{sup}$, $\inf I = i_{inf\_}$

$\sup F = f_{sup\_}$, $\inf F = f_{inf\_}$ and

$n_{sup} = t_{sup} + i_{sup} + f_{sup\_}$ $\quad$ $n_{inf\_} = t_{inf\_} + i_{inf} + f_{inf}$,

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T, I, F are called neutrosophic components. Let **U** be an universe of discourse, and **M** a set included in **U**. An element x from **U** is noted with respect to the set **M** as **x(T,I,F)** and belongs to **M** in the following way: it is t % true in the set, i % indeterminate (unknown if it is) in the set, and f % false, where t varies in ***T***, i varies in ***I***, f varies in ***F***. The set **M** is called a neutrosophic set (NS).

Definition 2. [11] A neutrosophic set **x (T,I,F)** is called paraconsistent if **inf (*T*)+inf (*I*)+inf (*F*) > 1.**

Definition 3. [9] The NSs $\mathbf{0_N}$ and $\mathbf{1_N}$ are defined as follows:
$\mathbf{0_N}$ may be defined as:
(0□) $\mathbf{0_N = x\ (0,0,1)}$
(0□) $\mathbf{0_N = x\ (0,1,1)}$
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(1□) $\mathbf{1_N = x\ (1,1,1)}$

Definition 4. [9] Let **X** be a non-empty set and $\mathbf{A = x}\ (T_A, I_A, F_A)$, $\mathbf{B = x}(T_B, I_B, F_B)$ are NSs. Then:
A∩B may be defined as:
(I□) $A \cap B = x\ (T_A \cdot T_B, I_A \cdot I_B, F_A \cdot F_B)$
(I□) $A \cap B = x\ (T_A \wedge T_B, I_A \wedge I_B, F_A \vee F_B)$
(I_3) $A \cap B = x\ (T_A \wedge T_B, I_A \vee I_B, F_A \vee F_B)$

A ∪B may be defined as:
(U_1) $A \cup B = x\ (T_A \vee T_B, I_A \vee I_B, F_A \wedge F_B)$
(U_2) $A \cup B = x\ (T_A \vee T_B, I_A \wedge I_B, F_A \wedge F_B)$

Definition 5. [9] Let $\{A_j / j \in J\}$ be an arbitrary family of NSs in ***X***, then
(1) $\cap \mathbf{A_j}$ may be defined as:
(i) $\cap A_j = x\ (\wedge, \wedge, \vee)$
(ii) $\cap A_j = x\ (\wedge, \vee, \vee)$

(2) $\cup A_j$ may be defined as:
(i) $\cup A_j = x\ (\vee, \vee, \wedge)$
(ii) $\cup A_j = x\ (\vee, \wedge, \wedge)$.

Definition 6. [9] A neutrosophic topology on a non-empyty set ***X*** is a family **τ** of NSs in ***X*** satisfying the following properties:
(1) 0_N and $1_N \in \tau$,
(2) $G_1 \cap G_2 \in \tau$, for any $G_1, G_2 \in \tau$
(3) $\cup G_j \in \tau$ or any subfamily $\{G_j\}_{j \in J}$ of τ.
In this case, the pair **(X,τ)** is called a neutrosophic topological space.

Proposition 1. The definitions above are not totally suitable for the study of paraconsistent neutrosophic topological spaces.

Proof. (1) It is necessary to omit a definition of ∩,because we will need ∩ of paraconsistent NSs to be paraconsistent. Indeed, let **A** =x (1/2,1/2,1/2) and B = x (1/2,1/3,1/3) (both are paraconsistent NSs), but 1/4+1/6+1/6 is not >1. Then, the case with product ((I□), in Definition 4) must be deleted for paraconsistent NSs.

(2) The definitions of 0_N and 1_N have also problems for paraconsistent NSs:

(a) Only (0□) and (1□), (1□), (1□) are paraconsistent.

(b) If we want that all NSs: $0_N \cup 0_N$, $0_N \cup 1_N$, $1_N \cup 1_N$, $0_N \cap 0_N$, ,and $0_N \cap 1_N$ to be paraconsistent NSs it is necessary delete 1_2 in Definition 3, because with this definition

$0_N \cap 1_N$ = to x (0,0,1) which is not paraconsistent, or x (0,1,1) = 0_N

The other cases have not problems:

$0_N \cup 0_N$ = x (0,1,1) = 0_N

$0_N \cup 1_N$ is equal either x (1,0,1), or x (1,1,0), or x (1,1,1) , i.e equal to 1_N

$1_N \cup 1_N$ is equal either x (1,0,1), or x (1,1,0), or x (1,1,1) , i.e equal to 1_N

$0_N \cap 0_N$ = x (0,1,1) = 0_N

$1_N \cap 1_N$ is equal either x (1,0,1), or x (1,1,0), or x (1,1,1) , i.e equal to 1_N

Then, after this changes in Definitions 3 and 4, Definition 6 is suitable for Smarandache's paraconsistent NSs, and one can work on paraconsistent neutrosophic topological spaces.

Definition 7. Let X be a non-empty set. A family τ of neutrosophic paraconsistent sets in X will called a paraconsistent neutrosophic topology if

(1) 0_N = x(0,1,1), and 1_N = x (1,1,0) or x(1,1,1), are in τ

(2) $G_1 \cap G_2 \in \tau$, for any G_1 ,G_2 $\in \tau$ (where ∩ is defined by (I_2) or (I_3))

(3) $\cup G_j \in \tau$ or any subfamily $\{G_j\}_{j \in J}$ of τ (where ∪ is defined by Definition 5).

In this case, the pair (X,τ) is called a paraconsistent neutrosophic topological space.

Remark. Above notion of paraconsistent neutrosophic topology generalizes Çoker's intuitionistic fuzzy topology when all sets are paraconsistent.

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