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NTMSCI 5, No. 4, 195-202 (2017) BISKA 195
New Trends in Mathematical Sciences

I–cluster points of filters

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Received: 1 October 2017, Accepted: 8 November 2017
Published online: 5 December 2017.

Abstract: In this paper, we have introduced the concept of I–cluster point of a filter on a topological space and studied its various properties. We have proved the necessary condition for a filter to have an I–cluster point. Most of the work in this paper is inspired from [2] and [23].

Keywords: Filters, nets, convergence, cluster point, ideal.

1 Introduction

The concept of convergence of a sequence of real numbers was extended to statistical convergence independently by H. Fast [4] and I. J. Schoenberg [22]. Kostyrko et. al. in [8], [9] generalized the notion of statistical convergence and introduced the concept of I–convergence of real sequences which is based on the structure of the ideal I of subsets of the set of natural numbers. Mursaleen et. al. [14] defined and studied the notion of ideal convergence in random 2–normed spaces and construct some interesting examples. Several works on I–convergence and statistical convergence have been done in [1], [3], [6], [7], [8], [9], [10], [13], [14], [15], [16], [17], [21]. The idea of I–convergence was extended from real number space to metric space by Kostyrko et. al [8] and to a normed linear space by Šalát et. al [20] in their recent works. Later the idea of I–convergence was extended to an arbitrary topological space by B. K. Lahiri and P. Das [11]. It was observed that the basic properties remained preserved in a topological space. Lahiri and Das [12] introduced the idea of I–convergence of nets in a topological space and examined how far it affects the basic properties.

Taking the idea of I and I^*–convergence of nets by Lahiri and Das in [12], Jamwal et. al introduced the concept of I–convergence of filters and studied its various properties in [6]. In [7], Jamwal et. al reintroduced the concept of I–convergence of nets in a topological space and established the equivalence of I–convergences of nets and filters on a topological space.
We recall the following definitions:

Definition 1. *Let X be a non-empty set. Then a family $\mathcal{F} \subset 2^X$ is called a* **filter** *on X if*

(i) $\Phi \notin \mathcal{F}$,
(ii) $A, B \in \mathcal{F}$ *implies* $A \cap B \in \mathcal{F}$ *and*
(iii) $A \in \mathcal{F}, B \supset A$ *implies* $B \in \mathcal{F}$.

Definition 2. *Let X be a non-empty set. Then a family $I \subset 2^X$ is called an* **ideal** *of X if*

(i) $\Phi \in I$,

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