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A new form of $\mathbb{F}$-compactness in L-fuzzy topological spaces

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ABSTRACT

In this paper, we give the concept of L-fuzzy $\mathbb{F}$-open operator in L-fuzzy topological spaces, and use it to introduce a new form of $\mathbb{F}$-compactness in L-fuzzy topological spaces. We also study some properties of L-fuzzy $\mathbb{F}$-compactness.

1. Introduction

In 1968, Chang [1] introduced fuzzy theory into topology. In Chang's fuzzy topology, the open sets are fuzzy, but the topology comprising those open sets is a crisp subset of I-power set I^X. The notion of Chang's fuzzy topology was extended to L-fuzzy setting by J. A. Goguen, which is now called L-topology. In 1985, Kubiak and Šostak [2,3], simultaneously and independently generalized Chang's fuzzy topology to I-subsets of I^X, which is called I-fuzzy topology.

There have been diverse studies on compactness in L-topology and L-fuzzy topology (see [4–19]). All of them were only motivated by using several kinds of open subsets. In fact, these kinds of open sets are still L-subsets. In [20], Shi introduced the semiopenness and preopenness as operators. The two new operators can be regarded as the degree to which the L-subset is semiopen and preopen, respectively. So, the new operators can be considered as a generalization of the notion of semiopen and preopen L-subsets because they reflect the essence of L-fuzzy topology.

In this paper, we introduce a new operator in L-fuzzy topology. This operator is the degree to which an L-subset is an $\mathbb{F}$-open subset. We will also use the new operator to introduce a new form of $\mathbb{F}$-compactness in L-fuzzy topological spaces. Our results in this paper is a generalization of the method used by Abd-Allah et al. [19].

2. Preliminaries

Throughout this paper, $(L, \leq, \bigwedge, \bigvee, ')$ is a complete DeMorgan algebra and X is a nonempty set. By $\perp$ and $\top$ we denote the smallest and the largest element in L, respectively. L^X is the set of all L-subsets on X. The smallest element and the largest element in L^X are denoted by $\underline{\perp}$ and $\underline{\top}$, respectively. A complete lattice L is a complete Heyting algebra if it satisfies the following infinite distributive law: for all $a \in L$ and all $B \subset L$,

$$a \wedge \bigvee B = \bigvee \{a \wedge b \mid b \in B\}.$$

An element a in L is called a prime element if $a \geq b \wedge c$ implies that $a \geq b$ or $a \geq c$. An element a in L is called coprime if a' is prime [21]. The set of non-unit prime elements in L is denoted by $P(L)$. The set of non-zero coprime elements in L is denoted by $M(L)$.

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