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SOME PROPERTIES OF TWO ALEXANDROV ARROWS AND THEIR PRACTICAL APPLICATION

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Abstract

This paper is devoted to the study of the ordinal characteristics of two Alexandrov arrows, which play an important role in set theory, topology, and mathematical logic. Alexandrov arrows are important objects of study in the context of category theory and order theory. In the course of the study, their geometric and topological properties are analyzed, as well as their influence on the construction of various mathematical models. Particular attention is paid to the application of these arrows in problems related to mappings between topological spaces and sets. The results of the work can be useful for the development of new methods in mathematical logic, topology, and category theory, as well as for further research in the field of algebra and graph theory. The description of these arrows helps to explore their geometric and topological properties, as well as their relationship with other mathematical objects, such as topological spaces and mappings. It is expected that the results of the study can serve as a basis for further research in the field of mathematical logic and category theory, expanding the understanding of the structure of arrows and their applications in various mathematical contexts.

Introduction

Topological space, non-empty subsets, Invariant, Suslin spaces, locally separable, Weak density, countable character, weakly separable, two Alexandrov arrows, Local density .

"One arrow" by P.S. Alexandrov [1]. Let's consider the half-interval $[0,1)$ number line. Let's introduce in $[0,1)$ the following topology:

all half intervals $[\alpha,\beta), 0\le\alpha<1, 0<\beta\le 1$, by definition, form the basis of this topology. The resulting topological space is denoted by X^{*}.

"Two Arrows" by P.S. Alexandrov [1]. Let's consider two intervals $X=[0,1), X'=(0,1]$, located one under the other. The set of all points of these two intervals will be denoted by X^{**}. Let's define in X^{**} topology as follows. The base of the topology consists of all possible sets of the form

$$U_1=[\alpha,\beta)\cup(\alpha',\beta'),\ U_2=(\alpha,\beta)\cup(\alpha',\beta'] .$$

Here $[\alpha,\beta)$ – half interval in X, and (α',β') – interval projection (α,β) on X'; $(\alpha',\beta']$ – half interval in X', an (α,β)– interval projection (α',β') in X. It is easy to show that X^{**} – compact.

We say that a topological space locally separable at a point $x\in X$, or X has a separable neighborhood. Topological space X is called locally separable if it is locally separable at every point $x\in X$.

Local density at a point $x\in X$ let's denote by $ld(x,X)$, which is defined as follows:

$ld(x,X)=\min\{d(Ox):\ where\ Ox$ - neighborhood of a point $x\}$.

Local density [2] of space X there is a greatest upper bound for all cardinal numbers $ld(x,X)$ for $x\in X$. We denote this cardinal number by $ld(X)$, those.

$ld(X)=\sup\{ld(x,X):\ x\in X\}$.

Local weak density at a point $x\in X$ let's denote by $lwd(x,X),$ defined as follows:

$lwd(x,X)=\min\{wd(Ox):\ where\ Ox$ - neighborhood of the point $x\}$.

The local weak density of space X is the least upper bound of all cardinal numbers $lwd(x,X),$ for $x\in X$. We denote this cardinal number by $lwd(X),$ those $lwd(X)=\sup\{lwd(x,X):\ x\in X\}$ [4].

Tightness of the point x in topological space X there is the smallest cardinal number $\tau\geq\aleph_0$ with the following property: if $x\in[C]$, then there is such a thing $C_0\subset C$, what $|C_0|\leq\tau$ and $x\in C_0$. This cardinal number is denoted by $t(x,X)$. Tightness of topological space X there is an exact upper bound for all numbers $t(x,X)$, $x\in X$. This $\lambda=\{E_\alpha:\alpha\in A\}$ The cardinal number is denoted $t(X)$ [2].

Family $\lambda=\{E_\alpha:\alpha\in A\}$ non-empty subsets of a topological space X is called a network of the space X, if for each point $x\in X$ and every neighborhood *U* points x there will be such a thing $E_\alpha\in\lambda$ which $x\in E_\alpha\subset U$ Or the network consists only of open sets, then λ is called the base of the space X Set A⊂X is called everywhere dense in X, or [A]=X . Density of space X is defined as the smallest cardinal number of the form |A|, where A – everywhere dense subset of space X. This cardinal number is denoted by d(X).

Family B (x) neighborhood of a point x is called the base of the topological space X at point x, if for any neighborhood V of a point x there exists such an element U ∈ B(x), which x∈U⊂V.

Character [2] points x in topological space X there is the smallest cardinal number of the form |B(x)|, where B(x)- base X at point x; this cardinal number is denoted $\chi(x,X)$.

Character [2] topological space X there is a greatest upper bound for all cardinal numbers $\chi(x,X)$ for $x\in X$; This cardinal number is denoted by $\chi(X)$. Or $\chi(X)\leq\aleph_0$ then we say that the space X satisfies the first axiom of countability The Suslin number of a space X is defined as follows:

Trouhg c (X) we denote the smallest of all cardinal numbers $\tau\geq\aleph_0$ satisfying the following condition the cardinality of each system of pairwise disjoint non-empty open subsets of the space X does not exceed τ.

Invariant c(X) is called the Suslin number of the space X if $c(X)\leq\aleph_0$ they say that X satisfies the Suslin condition

It is said that the weak density of a topological space X equal $\tau\geq\aleph_0$ if $\tau-$ the smallest cardinal number such that in X exists π -base, disintegraging rate

τ centered systems of open sets, i.e. there are π-base $B = \cup\{B_\alpha : \alpha \in \mathrm{A}\}$, where B_α – centered system of open sets for each $\alpha \in \mathrm{A}, |\mathrm{A}| = \tau$ [4].

Weak density of topological space X is denoted by $wd(\mathrm{X})$. It turns out that the definition of weak density allows for weakening. If $wd(\mathrm{X}) = \aleph_0$ then the topological space X *is weakly separable.*

Theorem. Let X - two arrows of Alexandrov. Then

1) $ld(X^{**}) = \aleph_0$;
2) $ldw(X^{**}) = \aleph_0$;
3) $t(X^{**}) = \aleph_0$;
4) X^{**} - separable space;
5) X^{**}- has a countable character;
6) X^{**}- satisfies the Suslin condition;
7) X^{**}- weakly separable

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