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«Algebraic and geometric methods  
of analysis»

Book of abstracts



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## LIST OF TOPICS

- Algebraic methods in geometry
- Differential geometry in the large
- Geometry and topology of differentiable manifolds
- General and algebraic topology
- Dynamical systems and their applications
- Geometric problems in mathematical analysis
- Geometric and topological methods in natural sciences
- History and methodology of teaching in mathematics

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НТБ ОНАФТ

## The local density and the local weak density of $N_\tau^\varphi$ -kernel of a topological space $X$ and superextensions

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**Definition 1.** *The weak density of a topological space  $X$  is the smallest cardinal number  $\tau \geq \aleph_0$  such that there is a  $\pi$ -base in  $X$  coinciding with  $\tau$  centered systems of open sets, i.e. there is a  $\pi$ -base  $B = \bigcup \{B_\alpha : \alpha \in A\}$ , where  $B_\alpha$  is a centered system of open sets for each  $\alpha \in A$  and  $|A| = \tau$  [1].*

The weak density of a topological space  $X$  is denoted by  $wd(X)$ . If  $wd(X) = \aleph_0$  then we say that a topological space  $X$  is weakly separable.

**Definition 2.** *We say that a topological space  $X$  is locally separable at a point  $x \in X$  if  $x$  has a separable neighborhood [2].*

A topological space is locally separable if it is locally separable at each point  $x \in X$ .

**Definition 3.** *We say that a topological space  $X$  is locally  $\tau$ -dense at a point  $x \in X$  if  $\tau$  is the smallest cardinal number such that  $x$  has a  $\tau$ -dense neighborhood in  $X$ .*

The local density at a point  $x$  is denoted by  $ld(x)$ . The local density of a space  $X$  is defined as the supremum of all numbers  $ld(x)$  for  $x \in X$ ; this cardinal number is denoted by  $ld(X)$ .

**Definition 4.** *A topological space is locally weakly  $\tau$  dense at a point  $x \in X$  if  $\tau$  is the smallest cardinal number such that  $x$  has a neighborhood of weak density  $\tau$  in  $X$*

The local weak density at a point  $x$  is denoted by  $lwd(x)$ .

The local weak density of a topological space  $X$  is defined with following way:  $lwd(X) = \sup\{lwd(x) : x \in X\}$ .

A system  $\xi = \{F_\alpha : \alpha \in A\}$  of closed subsets of a space  $X$  is called *linked* if any two elements from  $\xi$  intersect. Any linked system can be complemented to a maximal linked system (MLS), but this complement is, as a rule, not unique [3].

**Proposition 1** [3]. *A linked system  $\xi$  of a space  $X$  is a MLS iff it possesses the following completeness property:*

*if a closed set  $A \subset X$  intersects with any element from  $\xi$ , then  $A \in \xi$ .*

Denote by  $\lambda X$  the set of all MLS of the space  $X$ . For an open set  $U \subset X$ , set

$$O(U) = \{\xi \in \lambda X : \text{there is an } F \in \xi \text{ such that } F \subset U\}.$$

The family of subsets in the form of  $O(U)$  covers the set  $\lambda X$  ( $O(X) = \lambda X$ ), that's why it forms an open subbase of the topology on  $\lambda X$ . The set  $\lambda X$  equipped with this topology is called *the superextension* of  $X$ .

A.V. Ivanov defined the space  $NX$  of complete linked systems (CLS) of a space  $X$  in a following way:

**Definition 5.** A linked system  $M$  of closed subsets of a compact  $X$  is called a *complete linked system* (a CLS) if for any closed set of  $X$ , the condition

“Any neighborhood  $OF$  of the set  $F$  consists of a set  $\Phi \in M$ ”  
implies  $F \in M$  [2].

A set  $NX$  of all complete linked systems of a compact  $X$  is called *the space  $NX$  of CLS of  $X$* . This space is equipped with the topology, the open basis of which is formed by sets in the form of

$E = O(U_1, U_2, \dots, U_n)(V_1, V_2, \dots, V_s) = \{M \in NX : \text{for any } i = 1, 2, \dots, n \text{ there exists } F_i \in M \text{ such that } F_i \subset U_i, \text{ and for any } j = 1, 2, \dots, s, F \cap V_j \neq \emptyset \text{ for any } F \in M\}$ , where  $U_1, U_2, \dots, U_n, V_1, V_2, \dots, V_s$

are nonempty open in  $X$  sets [4].

**Definition 6.** Let  $X$  be a compact space,  $\varphi$  be a cardinal function and  $\tau$  be an arbitrary cardinal number. We call an  $N_\tau^\varphi$  - kernel of a topological space  $X$  the space

$$N_\tau^\varphi X = \{M \in NX : \exists F \in M : \varphi(F) \leq \tau\}.$$

**Theorem 7.** Let  $X$  be an infinite  $T_1$ -space and  $h\varphi(X) \leq \tau$ . Then

- 1)  $ld(\lambda X) = ld(N_\tau^\varphi X)$ ;
- 2)  $lwd(\lambda X) = lwd(N_\tau^\varphi X)$ .

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