The local density and the local weak density of N_τ^φ-kernel of a topological spaces

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We say that a topological space X is locally τ-dense at a point $x \in X$ if τ is the smallest cardinal number such that x has a τ -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 $ld(X)$.

A topological space is locally weakly dense at a point $x \in X$ if τ is the smallest cardinal number such that x has a neighborhood of weak density τ in X. The weak density at a point x is denoted by $lwd(x)$.

A topological space X is called locally weakly τ-dense if it is weakly τ-dense at each point $x \in X$.

The local weak density of a topological space X is defined with following way:

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

A system $\xi = \{F_\alpha :\ \alpha \in A\}$ of closed subsets of a space X is called *linked* if any two elements from ξ intersect [1].

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

Definition 1. 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

$E = O(U_1, U_2, \ldots, U_n)\langle V_1, V_2, \ldots, V_s\rangle = \{M \in NX$: for any $i = 1, 2, \ldots, n$ there exists $F_i \in M$ such that $F_i \subset U_i$, and for any $j = 1, 2, \ldots, s$, $F \cap V_j \neq \varnothing$ for any $F \in M\}$, where $U_1, U_2, \ldots, U_n$, $V_1, V_2, \ldots, V_s$ are nonempty open in X sets [2].

Definition 2. Let X be a compact space, φ be a cardinal function and τ be an arbitrary cardinal number. We call *an N_τ^φ - kernel* of a topological space X the space

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

Theorem 3. *Let X be an infinity compact space and $\varphi = d, \tau = \aleph_0$. Then:*

1) $ld(N_\tau^\varphi X) \neq ld(X)$;

2) $lwd(N_\tau^\varphi X) \neq lwd(X)$.

References

[1] Fedorchuk V. V., Filippov V. V. *General Topology. Basic Constructions.* Fizmatlit, Moscow. 2006.

[2] Ivanov A. V. Cardinal-valued invariants and functors in the category of bicompacts. *Doctoral thesis in physics and mathematics*, Petrozavodsk, 1985.