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Algebraic and Geometric Methods of Analysis

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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

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ІНТЕРНАЦІОНАЛЬНИЙ ЦЕНТР СПІВРОБІТНИЦТВА

The density and the local density of the space of permutation degree

A. Kh. Sadullaev

(National University of Uzbekistan, Uzbekistan)

E-mail: anvars1997@mail.ru

F. G. Mukhamadiev

(National University of Uzbekistan, Uzbekistan)

E-mail: farhod8717@mail.ru

A permutation group X is the group of all permutations (i.e. one-one and onto mappings $X \rightarrow X$). A permutation group of a set X is usually denoted by $S(X)$. If $X = \{1, 2, 3, \dots, n\}$, $S(X)$ is denoted by S_n , as well [1].

Let X^n be the n -th power of a compact X . The permutation group S_n of all permutations, acts on the n -th power X^n as permutation of coordinates. The set of all orbits of this action with quotient topology we denote by $SP^n X$. Thus, points of the space $SP^n X$ are finite subsets (equivalence classes) of the product X^n . Thus two points $(x_1, x_2, \dots, x_n), (y_1, y_2, \dots, y_n) \in X^n$ are considered to be equivalent if there is a permutation $\sigma \in S_n$ such that $y_i = x_{\sigma(i)}$. The space $SP^n X$ is called the n -permutation degree of a space X . Equivalent relation by which we obtained space $SP^n X$ is called the symmetric equivalence relation. The n -th permutation degree is always a quotient of X^n . Thus, the quotient map is denoted by as following: $\pi_n^s : X^n \rightarrow SP^n X$.

Where for every $x = (x_1, x_2, \dots, x_n) \in X^n$, $\pi_n^s((x_1, x_2, \dots, x_n)) = [(x_1, x_2, \dots, x_n)]$ is an orbit of the point $X = (x_1, x_2, \dots, x_n) \in X^n$.

The concept of a permutation degree has generalizations. Let G be any subgroup of the group S_n . Then it also acts on X^n as group of permutations of coordinates. Consequently, it generates a G -symmetric equivalence relation on X^n . This quotient space of the product of X^n under the G -symmetric equivalence relation is called G -permutation degree of the space X and it is denoted by SP_G^n . An operation $SP_G^n = SP^n$ is also the covariant functor in the category of compacts and it is said to be a functor of G -permutation degree. If $G = S_n$ then $SP_G^n = SP^n$. If the group G consists only of unique element then $SP_G^n = X^n$.

We say that the local density of a topological space X is τ at a point x , if τ is the smallest cardinal number such that x has a neighborhood of density τ in X . The local density at a point x is denoted by $ld(x)$. The local density of a topological space X is defined as the supremum of all numbers $ld(x)$ for $x \in X$ $ld(X) = \sup\{ld(x) : x \in X\}$ [2].

It is known that, for any topological space we have $ld(X) \leq d(X)$.

Theorem 1. *Let X be an infinite T_1 -space and Y is a dense in X . Then $SP^n Y$ is also dense in $SP^n X$.*

Theorem 2. *Let X be an infinite T_1 -space and Y is a local dense in X . Then $SP^n Y$ is also local dense in $SP^n X$.*

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