International
Scientific Conference

Algebraic and Geometric Methods of Analysis

Devoted to 160 anniversary of
Dvytro Grave
(25.08.1863 - 19.12.1939)
Academician of the Ukrainian Academy of Sciences, the first director of the Institute of Mathematics of NAS of Ukraine

May 29 – June 1, 2023
Odesa, Ukraine

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 and topological methods in natural sciences
- Geometric problems in mathematical analysis

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Homotopy types of diffeomorphisms groups of simplest Morse-Bott foliations on lens spaces

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Let F be the Morse-Bott foliation on the solid torus $T = S^1 \times D^2$ into 2-tori parallel to the boundary and one singular circle $S^1 \times 0$. A diffeomorphism $h : T \to T$ is called *foliated* (resp. *leaf preserving*) if for each leaf $\omega \in F$ its image $h(\omega)$ is also leaf of F (resp. $h(\omega) = \omega$). Gluing two copies of T by some diffeomorphism between their boundaries, one gets a lens space $L_{p,q}$ with a Morse-Bott foliation $F_{p,q}$ obtained from F on each copy of T. Denote by $\mathcal{D}^{fol}(T, \partial T)$ and $\mathcal{D}^{lp}(T, \partial T)$ respectively the groups of foliated and leaf preserving diffeomorphisms of T fixed on the boundary ∂T. Similarly, let $\mathcal{D}^{fol}(L_{p,q})$ and $\mathcal{D}^{lp}(L_{p,q})$ be respectively the groups of foliated and leaf preserving diffeomorphisms of $F_{p,q}$. Endow all those groups with the corresponding C^∞ Whitney topologies. The aim of the talk is give a complete description the homotopy types of the above groups $\mathcal{D}^{fol}(T, \partial T)$, $\mathcal{D}^{lp}(T, \partial T)$, $\mathcal{D}^{fol}(L_{p,q})$, $\mathcal{D}^{lp}(L_{p,q})$ for all p, q.

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Spaces of idempotent measures with countable support

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Methods of infinite-dimensional topology can be applied to the problem of description of topology of various objects in particular, hyperspaces and spaces of probability measures (see [1]-[3]). It is our aim to consider the topology of spaces of idempotent measures, which are counterparts of probability measures in the idempotent mathematics (see, e.g, [5]).

Having in mind the identification of every idempotent measure with its density function, we consider, for every metric space X, the set $\bar{I}(X)$ of the closed subsets A of $X \times [0, 1]$ satisfying the following properties:

Definition 1. (1) A is saturated, i.e. $\forall (x, t) \in A \ \forall t',\ 0 \le t' \le t \Rightarrow (x, t') \in A$;

(2) $X \times \{0\} \subset A$;

(3) $A \cap (X \times \{1\}) \neq$.

The support of any $A \in \bar{I}(X)$ is the set
$$\mathrm{supp}(A) = \mathrm{Cl}\ (\{\ x \in X \mid \exists t > 0, (x,t) \in A\}).$$
The set $\in \bar{I}(X)$ is endowed with the Hausdorff metric induced by the max-metric on $X \times [0,1]$. Some hyperspaces of countable closed sets in metric spaces are considered in [3]. Denote by A' is the derived set (the set of all accumulation points) of A.

We introduce the following spaces of idempotent measures:
$$\bar{A}_n(X) = \{A \in \bar{I}(X) \mid 1 \leq |(\mathrm{supp}(A))'| \leq n\} \quad (n \in \mathbb{N});$$
$$\bar{A}_\omega(X) = \bigcup_{n \in \mathbb{N}} \bar{A}_n(X).$$
By $\mathcal{K}(X \times [0,1])$ we denote the hyperspace of all countable compact subsets of $X \times [0,1]$.

Theorem 2. *Let X be a separable metric space. Then:*

(1) *For $n \in \mathbb{N}$, the space $\bar{A}_n(X)$ is $F_{\sigma\delta}(\mathcal{K}(X \times [0,1]))$;*
(2) *$\bar{A}_\omega(X)$ is $F_{\sigma\delta\sigma}(\mathcal{K}(X \times [0,1]))$.*

The proof of this statement is based on some results from [3].

We then apply some characterization results of infinite-dimensional topology (see [4]) to describe the topology of spaces $\bar{I}(X)$ for noncompact locally compact separable metric spaces X.

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SKT hyperbolic and Gauduchon hyperbolic compact complex manifolds

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Definition 1. Let X be a compact complex manifold with $\dim_{\mathbb{C}} X = n$, and ω be a metric on X: be a C^∞ positive definite $(1,1)$-form on X .

i) ω is *Kähler*, if $d\omega = 0$.
ii) ω is *balanced*, if $d\omega^{n-1} = 0$.
iii) ω is *Gauduchon*, if $\bar{\partial}\partial\omega^{n-1} = 0$, such a metric always exists on a compact complex manifold.