



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

ORGANIZERS

- Ministry of Education and Science of Ukraine
- Odesa National University of Technology
- Institute of Mathematics of the National Academy of Sciences of Ukraine
- Taras Shevchenko National University of Kyiv
- Kyiv Mathematical Society

SCIENTIFIC COMMITTEE

- | | |
|--|---|
| • Bolotov D. (<i>Kharkiv, Ukraine</i>) | • Konovenko N. (<i>Odesa, Ukraine</i>) |
| • Bondarenko V. (<i>Kyiv, Ukraine</i>) | • Maksymenko S. (<i>Kyiv, Ukraine</i>) |
| • Boychuk O. (<i>Kyiv, Ukraine</i>) | • Mikhailets V. (<i>Kyiv, Ukraine</i>) |
| • Boyko V. (<i>Kyiv, Ukraine</i>) | • Ostrovskiy V. (<i>Kyiv, Ukraine</i>) |
| • Cherevko Ye. (<i>Odesa, Ukraine</i>) | • Petravchuk A. (<i>Kyiv, Ukraine</i>) |
| • Dorogovtsev A. (<i>Kyiv, Ukraine</i>) | • Plaksa S. (<i>Kyiv, Ukraine</i>) |
| • Drozd Yu. (<i>Kyiv, Ukraine</i>) | • Portenko M. (<i>Kyiv, Ukraine</i>) |
| • Gerasymenko V. (<i>Kyiv, Ukraine</i>) | • Pratsiovytyi M. (<i>Kyiv, Ukraine</i>) |
| • Fedchenko Yu. (<i>Odesa, Ukraine</i>) | • Savchenko O. (<i>Kherson, Ukraine</i>) |
| • Kiosak V. (<i>Odesa, Ukraine</i>) | • Romanyuk A. (<i>Kyiv, Ukraine</i>) |
| • Kochubei A. (<i>Kyiv, Ukraine</i>) | • Timokha O. (<i>Kyiv, Ukraine</i>) |

ORGANIZING COMMITTEE

- | | |
|--|---|
| • Maksymenko S. (<i>Kyiv, Ukraine</i>) | • Cherevko Ye. (<i>Odesa, Ukraine</i>) |
| • Konovenko N. (<i>Odesa, Ukraine</i>) | • Osadchuk Ye. (<i>Odesa, Ukraine</i>) |
| • Fedchenko Yu. (<i>Odesa, Ukraine</i>) | • Sergeeva O. (<i>Odesa, Ukraine</i>) |

Corollary 2. *Let, under conditions of Theorem 1, Γ denotes the family of all paths joining the segments $[A, C]$ and $[B, D]$ in D' . Then*

$$M(\Gamma) \leq \frac{m(D')}{C_0^n} \cdot \frac{1}{|A - B|^n}, \quad (4)$$

where M is the modulus of families of paths defined in (3), $m(D')$ denotes the Lebesgue measure of D' , and C_0 is a constant in (1).

Corollary 3. *Let, under conditions of Theorem 1, Γ denotes the family of all paths joining the segments $[A, C]$ and $[B, D]$ in D' . Then*

$$M(\Gamma) \geq \tilde{c}_n \cdot \log \left(1 + \frac{3\delta_*}{8|A - B|} \right), \quad (5)$$

where M is the modulus of families of paths defined in (3), $\tilde{c}_n > 0$ is some constant depending only on n and D' .

REFERENCES

- [1] Sevost'yanov E.A. (2022). On logarithmic Hölder continuity of mappings on the boundary. *Annales Fennici Mathematici*, 47, 251–259.
- [2] Martio, O., Ryazanov, V., Srebro, U., Yakubov, E. (2009). *Moduli in Modern Mapping Theory*. Springer Monographs in Mathematics. New York etc., Springer.
- [3] Martio, O., Ryazanov, V., Srebro, U., Yakubov, E. (2004). Mappings with finite length distortion. *J. d'Anal. Math.*, 93, 215–236.
- [4] Martio, O., Ryazanov, V., Srebro, U., Yakubov, E. (2005). On Q -homeomorphisms. *Ann. Acad. Sci. Fenn. Math.*, 30(1), 49–69 (2005).

Backström curves

Yuriy Drozd

(Harvard University & Institute of Mathematics of the NAS of Ukraine)

E-mail: y.a.drozd@gmail.com

Recall some definitions.

- Definition 1.** (1) A *non-commutative curve* is a pair (X, \mathcal{A}) , where X is an algebraic curve over a field \mathbb{k} and \mathcal{A} is a sheaf of \mathcal{O}_X -algebras coherent as a sheaf of \mathcal{O}_X -modules.
- (2) A non-commutative curve (X, \mathcal{H}) is called *hereditary* if for every point $x \in X$ the localization \mathcal{H}_x is hereditary (equivalently, $\text{gl.dim } \mathcal{H} = 1$).
- (3) A non-commutative curve (X, \mathcal{A}) is called *Backström* if there is a hereditary non-commutative curve (X, \mathcal{H}) such that $\mathcal{H} \supset \mathcal{A}$ and $\text{rad } \mathcal{H}_x = \text{rad } \mathcal{A}_x$ for all points $x \in X$.
- (4) The *Auslander envelope* of a Backström non-commutative curve (X, \mathcal{A}) is defined as the non-commutative curve $(X, \tilde{\mathcal{A}})$, where $\tilde{\mathcal{A}} = \text{End}_{\mathcal{A}}(\mathcal{A} \oplus \mathcal{H})$.

For instance, every (usual) algebraic curve such that all its singularities are simple nodes is a Backström curve, as well as the union of the coordinate axes in the affine space of any dimension.

We study the structure of Backström curves and their Auslander envelopes and prove the following results.

Theorem 2. *Let (X, \mathcal{A}) be a Backström non-commutative curve, $(X, \tilde{\mathcal{A}})$ be its Auslander envelope.*

- (1) $\text{gl.dim } \tilde{\mathcal{A}} \leq 2$.
- (2) $\text{der.dim } \mathcal{A} \leq 2$, where $\text{der.dim } \mathcal{A}$ denotes the derived dimension of \mathcal{A} , that is the Rouquier dimension [2] of the perfect derived category $\mathcal{D}^{\text{perf}}(\text{Coh } \mathcal{A})$.

Local versions of these results are proved in [1].

We also study the action of finite groups on Backström curves and prove the following theorem.

Theorem 3. *Let a finite group of order n acts on a Backström curve (X, \mathcal{A}) and $\text{char } \mathbb{k} \nmid n$. Then the crossed product $(X, \mathcal{A} * G)$ is also a Backström curve and its Auslander envelope is $(X, \tilde{\mathcal{A}} * G)$.*

Some examples will also be presented.

REFERENCES

- [1] Yuriy Drozd. Backström algebras. arXiv:2206.12875 [mathRT], 2022.
- [2] Raphaël Rouquier. Dimensions of triangulated categories. *Journal of K-Theory*, 1(2):193–256, 2008. (to appear in *Pacific J. Math.*)

On geodesic lines of Riemannian metric for Navier-Stokes equations

Valerii Dryuma

(Institute of Mathematics State University of Moldova, Kishinev, Moldova)

E-mail: valdryum@gmail.com

Theorem 1. *The 14D Riemann metric in local coordinates*

$$\vec{x} = (x, y, z, t, \eta, \rho, m, u, v, w, p, \xi, \chi, n)$$

$$\begin{aligned} ds^2 = & 2 dxdu + 2 dydv + 2 dzdw + (-W(\vec{x}, t)w - V(\vec{x}, t)v - U(\vec{x}, t)u) dt^2 + \\ & + \left(-U(\vec{x}, t)p - u(U(\vec{x}, t))^2 - uP(\vec{x}, t) + w\mu \frac{\partial}{\partial z} U(\vec{x}, t) - wU(\vec{x}, t)W(\vec{x}, t) \right) d\eta^2 + \\ & + \left(v\mu \frac{\partial}{\partial y} U(\vec{x}, t) - vU(\vec{x}, t)V(\vec{x}, t) + u\mu \frac{\partial}{\partial x} U(\vec{x}, t) \right) d\eta^2 + 2 d\eta d\xi + 2 d\rho d\chi + 2 dmdn + \\ & + \left(-V(\vec{x}, t)p - vP(\vec{x}, t) - v(\vec{x}, t)^2 - V(\vec{x}, t)W(\vec{x}, t)w + v\mu \frac{\partial}{\partial y} V(\vec{x}, t) - uU(\vec{x}, t)V(\vec{x}, t) \right) d\rho^2 + \\ & + \left(u\mu \frac{\partial}{\partial x} V(\vec{x}, t) \right) d\rho^2 + \left(-uU(\vec{x}, t)W(\vec{x}, t) - w(W(\vec{x}, t))^2 - wP(\vec{x}, t) + w\mu \frac{\partial}{\partial z} W(\vec{x}, t) \right) dm^2 + \\ & + \left(v\mu \frac{\partial}{\partial y} W(\vec{x}, t) - vV(\vec{x}, t)W(\vec{x}, t) + u\mu \frac{\partial}{\partial x} W(\vec{x}, t) - W(\vec{x}, t)p \right) dm^2 \quad (1) \end{aligned}$$

Table of contents

L. M. Alabdulsada, L. Kozma <i>Hopf-Rinow theorem of sub-Finslerian geometry</i>	2
Y. Aliyev <i>Geometric properties of interception curves</i>	3
M. Amram <i>Planar and non-planar degenerations with related fundamental groups</i>	5
N. Ando <i>Surfaces with zero mean curvature vector in 4-dimensional spaces</i>	6
B. Apanasov <i>Dynamics in nilpotent groups and deformations of locally symmetric rank one manifolds</i>	8
M. Atteya <i>Characterizing Linear Mappings Through Unital Algebra</i>	9
S. Sharma, V. K. Bhat <i>Edge resolvability and topological characteristics of zero-divisor graphs</i>	10
V. Bilet, O. Dovgoshey <i>From minimality to maximality via metric reflection</i>	12
D. Bolotov <i>Thurston norm and Euler classes of bounded mean curvature foliations on hyperbolic 3-Manifolds</i>	14
A. Bolsinov <i>Nijenhuis geometry and its applications</i>	15
E. Bonacci <i>Shape optimization in the batch crystallization of CAM</i>	17
F. Bulnes <i>Homotopies to Diffeomorphisms in Symplectic Field Theory</i>	18
D. Cheban <i>Global asymptotic stability of generalized homogeneous dynamical systems</i>	19
Y. Cherevko, V. Berezovski, J. Mikeš, Y. Fedchenko <i>Hyper-holomorphically projective mappings of hyper-Kähler manifolds</i>	21
S. Dann <i>On a problem of Fejes Toth</i>	22
M. Golasinski, T. de Melo, R. Bononi <i>Gottlieb groups of some Moore spaces</i>	23
A. Białyżyt, A. Denkowska, M. P. Denkowski <i>Inner semi-continuity of medial axes and conflict sets</i>	24
K. v. Dichter <i>The diameter-width-ratio for complete and pseudo-complete sets</i>	25
O. Dovhopiatyi <i>On the possibility of joining two pairs of points in convex domains using paths</i>	27
Yu. Drozd <i>Backström curves</i>	28