



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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About some Steiner trees

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will talk about the famous Steiner problem.

We denote by \mathcal{H}^1 the linear Haurdorff measure (roughly speaking, length).

Problem 1 (Euclidean Steiner problem). Let C be a compact subset of \mathbb{R}^d . To find a closed S such that $S \cup C$ is connected and $\mathcal{H}^1(S)$ is minimal.

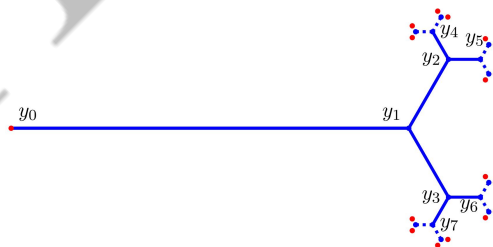
Some properties (if $\mathcal{H}^1(S) < \infty$) hold:

- S exists;
- S contains no loops;
- only two variants of neighbourhoods for points from $S \setminus C$;
- only two variants of a neighbourhood of a point $x \in S \setminus C$:
 - a regular tripod (x is a **branching point**);
 - a segment; x is an inner point.
- S contains at most countable number of branching points.

Usually S is usually called **Steiner tree**, and it is called **indecomposable** (irreducible, full), when $S \setminus C$ is connected. If C is totally disconnected then S should be connected.

Theorem 2 (Paolini–Stepanov–T, 2015; Cherkashin–T. 2023; Paolini–Stepanov 2023). *There is a compact planar set C for which the unique solution of the Steiner problem is indecomposable and has infinite number of triple points.*

In the theorem C and Σ are self-similar fractals with a sufficiently small scale factor.



Theorem 3 (Basok, Cherkashin, T., 2022). *In the plane for $m \geq 4$ the set of m terminals (considered as a subset of \mathbb{R}^{2m}) with non unique Steiner trees has the Hausdorff dimension $2m - 1$.*

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The multiplicities of non-acyclic SL_2 -representations and L -functions of twisted Whitehead links

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We briefly survey a joint work [2] with Léo Bénard, Ryoto Tange, and Anh T. Tran, which is a continuation of our previous work [8] (See also [6, 9, 1, 7] and [4, 5, 3]).

We consider a natural divisor on $SL_2\mathbb{C}$ -character varieties of knots and links, given by the so-called acyclic Reidemeister torsion. We provide a geometric interpretation of this divisor. We focus on the particular family of odd twisted Whitehead links W_{2k-1} , where we show that this divisor has multiplicity two. Moreover, we apply these results to the study of the L -functions of the universal deformations of representations over finite fields of twisted Whitehead links.

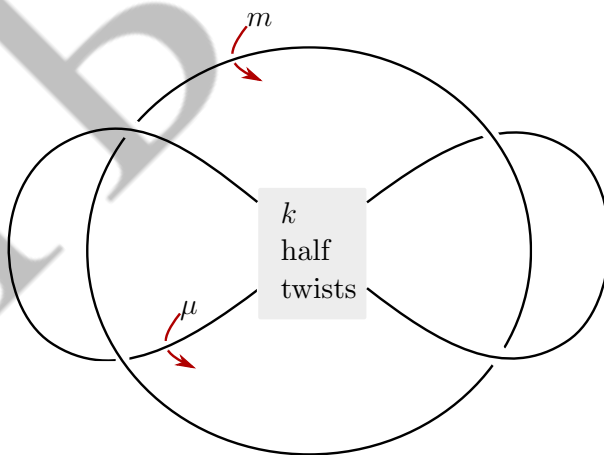


FIGURE 0.1. The twisted Whitehead link W_k

E. Petrov, R. Salimov <i>Fixed point theorem for mappings contracting perimeters of triangles and its generalizations</i>	84
A. Prishlyak <i>Structure of codimensional one flows on the 2-sphere with holes</i>	86
A. Arman, A. Bondarenko, A. Prymak <i>Convex bodies of constant width with exponential illumination number</i>	88
G. Riabov <i>Bifurcation points in random dynamical systems</i>	89
D. Ryabogin <i>On symmetries of sections of convex bodies</i>	90
A. Savchenko <i>Fuzzy metrization of spaces of \star-measures</i>	91
O. Sazonova <i>Continual distribution with acceleration and condensation flows</i>	92
R. Servadei <i>On a flower-shape geometry</i>	93
E. Sevost'yanov, N. Ilkevych <i>On equicontinuity of families of mappings with one normalization condition by the prime ends</i>	93
O. Shugailo <i>Equiaffine immersions of codimension two with flat connection</i>	95
H. Sinyukova <i>Some vanishing theorems of sufficient character about holomorphically projective mappings of Kahlerian spaces on the whole</i>	97
A. Skryabina, P. Stegantseva <i>Investigation of the connection between different models of topologies on a finite set</i>	98
R. Skuratovskii <i>Normal subgroups of iterated wreath products of symmetric groups and alternating with symmetric groups</i>	99
A. Serdyuk, I. Sokolenko <i>Asymptotic behavior of the widths of classes of the generalized Poisson integrals</i>	102
A. Bodin, P. Popescu-Pampu, M.-S. Sorea <i>Poincaré-Reeb graphs of real algebraic domains</i>	104
D. Dmytryshyn, D. Gray, and A. Stokolos <i>On univalent trinomials</i>	105
Kh. Sukhorukova <i>On K-ultrametrics and \ast-measures</i>	106
S. Tateno <i>The Iwasawa invariants of Z_p^d-covers of links</i>	106
A. Teleman <i>The Riemann-Hilbert problem and holomorphic bundles framed along a real hypersurface</i>	107
Y. Teplitskaya <i>About some Steiner trees</i>	109
J. Ueki <i>The multiplicities of non-acyclic SL_2-representations and L-functions of twisted Whitehead links</i>	110
J. F. Peters, T. Vergili <i>Proximal connectedness. Spatially and descriptively connected spaces</i>	111