Scientific report

for the project

PN-II-ID-PCE-2011-3-0533

October 2011 – October 2016

In this project we investigate of the space of all Alexandrov surfaces and significant subspaces of it. The importance of Alexandrov spaces stems mainly from the generality of the concept, which allows both differentiable and non-differentiable manifolds to be included in the investigation. An important class of Alexandrov surfaces is that of convex surfaces. In many applications, precisely the non-differentiable case, particularly the theory of polyhedra, including the graphs which are their 1-skeleta, is the prevailing one. Thus, the study of graphs essentially appearing in computer networks is also included in our project.

I. Articles

1. K. Adiprasito, T. Zamfirescu: *Large Curvature on Typical Convex Surfaces*,

J. Convex Analysis 19 (2012), 385-391; **ISI**, IF= 0.625, RIS=0.96.

We show in this paper that on most convex surfaces there exist points with arbitrarily large lower curvature in every tangent direction. Moreover, we show that, astonishingly, on most convex surfaces, although the set of points with curvature 0 in every tangent direction has full measure, it contains no pair of opposite points, i.e. points admitting parallel supporting planes.

2. L. Yuan, **T. Zamfirescu**: *Acute triangulations of double planar convex bodies*,

Publ. Math. Debrecen 81 (2012), 121-126; **ISI**, IF=0.322, RIS=0.56.

A (2-dimensional) double convex body 2K is a surface homeomorphic to the sphere consisting of two planar isometric compact convex bodies, K and K', with boundaries glued in the obvious way. In this note we prove that, if K admits two perpendicular axes of symmetry and bd K satisfies a certain curvature condition, then 2K admits an acute triangulation of size 72. In particular, each double ellipse admits such a triangulation.

3. J. Rouyer, C. Vîlcu: *Sets of tetrahedra, defined by maxima of distance functions,*
An. St. Univ. Ovidius Constanta 20 (2012), 197-212; **ISI**, IF= 0.221, RIS=0.

We study tetrahedra and the space of tetrahedra from the viewpoint of local and global maxima for intrinsic distance functions.

4. A. D. Jumani, **T. Zamfirescu**: *On Longest Paths in Triangular Lattice Graphs*,
Utilitas Math. 89 (2012), 269-273; **ISI**, FI= 0.280, SRI=0.52.

We present two graphs embeddable into the equilateral triangular lattice and satisfying Gallai's property that every vertex is missed by some longest path.

5. Y. Bashir, **T. Zamfirescu**: *Lattice graphs with Gallai's property*,
Bull. Math. Soc. Sci. Math. Roumanie 56 (2013), 65-71; **ISI**, IF=0.419, RIS=0.

We investigate graphs with the property that all longest paths or all longest cycles have empty intersection. In this paper, we find such graphs as subgraphs of cubic lattices.

6. J. Rouyer: *On p-tuples of the Grassmann manifolds*,
J. Geometry 104 (2013), 165-200; **IDB**.

We provide a matrix invarariant for isometry classes of p-tuples of points in the Grassmann manifold $G_n(K^d)$ ($K = R$ *or* C). This invariant fully caracterizes the p-tuple. We use it to determine the regular p-tuples of $G_2(R^d)$, $G_3(R^d)$ şi $G_2(C^d)$.

7. A. Shabbir, C. T. Zamfirescu, **T. Zamfirescu**: *Intersecting longest paths and longest cycles: A survey*, Electron. J. Graph Theory Appl. 1 (2013), 56-76; **IDB**.

This is a survey of results obtained during the last 45 years regarding the intersection behaviour of all longest paths, or all longest cycles, in connected graphs. Planar graphs and graphs of higher connectivity receive special attention. Graphs embeddable in the cubic lattice of arbitrary dimension, and graphs embeddable in the triangular or hexagonal lattice of the plane are also discussed. Results concerning the case when not all, but just some longest paths or cycles are intersected, for example two or three of them, are also reported.

8. S. Malik, A. M. Qureshi, **T. Zamfirescu**: *Hamiltonicity of cubic 3-connected k-Halin graphs*,
Electron. J. Combin. 20 (2013) #P66; **ISI**, IF=0.532, RIS=1.23.

We investigate here how far we can extend the notion of a Halin graph such that hamiltonicity is preserved. Let $H=T\cup C$ be a Halin graph, T being a tree and C the outer cycle. A k-Halin graph G can be obtained from H by adding edges while keeping planarity, joining vertices of $H-C$, such that $G-C$ has at most k cycles. We prove that, in the class of cubic 3-connected graphs, all 14-Halin graphs are hamiltonian and all 7-Halin graphs are 1-edge hamiltonian. These results are best possible.

9. A. Shabbir, **T. Zamfirescu**: *Highly non-concurrent longest cycles in lattice graphs*,
Discrete Math. 313 (2013), 1908-1914; **ISI**, IF=0.578, RIS=0.69.

There exist planar graphs in which any two vertices are missed by some longest cycle. Although this requirement is very strong, we prove here that such graphs can also be found as subgraphs of the square and hexagonal lattices. Considering (finite) such lattices on the torus and on the Moebius strip enables us to reduce the order of our examples.

10. L. Jia, L. Yuan, C. T. Zamfirescu, **T. Zamfirescu**: *Balanced triangulations*,
Discrete Math. 313 (2013), 2178-2191; **ISI**, IF=0.578, RIS=0.69.

Motivated by applications in numerical analysis, we investigate balanced triangulations, i.e. triangulations where all angles are strictly larger than π/6 and strictly smaller than π/2, giving the optimal lower bound for the number of triangles in the case of the square. We also investigate platonic surfaces, where we find for each one its respective optimal bound. In particular, we settle (affirmatively) the open question whether there exist acute triangulations of the regular dodecahedral surface with 12 acute triangles [Itoh and Zamfirescu, Europ. J. Combin. 28 (2007)].

11. R. Euler, **T. Zamfirescu**: *On Planar Toeplitz Graphs*,
Graphs Combin. 29 (2013), 1311-1327; **ISI**, IF=0.351, RIS=0.83.

We describe several classes of finite, planar Toeplitz graphs and present results on their chromatic number. We then turn to counting maximal independent sets in these graphs and determine recurrence equations and generating functions for some special cases.

12. F. Nadeem, A. Shabbir, **T. Zamfirescu**: *Planar Lattice Graphs with Gallai*'s *Property*,
Graphs Combin. 29 (2013), 1523-1529; **ISI**, IF=0.351, RIS=0.83.

In this paper we construct families of planar lattice graphs enjoying Gallai's Property.

13. I. Bárány, **T. Zamfirescu**: Circles holding typical convex bodies,
Libertas Math. 33 (2013), 21-25; **IDB**.

A circle C holds a convex body K⊂R^3 if K can’t be moved far away from its position without intersecting C. We prove here that, for most convex bodies, the space of all holding circles has infinitely many components.

14. I. Bárány, **T. Zamfirescu**: *Holding Circles and Fixing Frames*,
Discrete Comput. Geom. 50 (2013), 1101-1111; **ISI**, IF=0.606.

One of our results says that there is a convex body K⊂R^3 such that the set of radii of all circles holding K has infinitely many components.

Another result says that the circle is unique in the sense that every frame different from the circle holds a convex body K (actually a tetrahedron) so that every nontrivial rigid motion of K intersects the frame.

15. T. Zamfirescu: *Right convexity*,
J. Convex Analysis, 21 (2014), 253-260; **ISI**, IF= 0.625, RIS=0.96.

A convex set is F-convex if every pair of points in the set lie in a right triangle included in the set. We characterize F-convex sets, find some classes of F-convex sets, investigate F-convexity for cones and cylinders, and find out that most convex bodies are F-convex. On our way, we also describe the curvature at the endpoints of diameters of most convex bodies.

16. J. O'Rourke, **C. Vîlcu**: *Development of Curves on Polyhedra via Conical Existence*,
Comput. Geom. Theory Appl. 47 (2014), 149-163; **ISI**, FI=0,570, SRI=0,994.

We establish that certain classes of simple, closed, polygonal curves on the surface of a convex polyhedron develop in the plane without overlap. Our primary proof technique shows that such curves "live on a cone," and then develops the curves by cutting the cone along a "generator" and flattening the cone in the plane. The conical existence results support a type of source unfolding of the surface of a polyhedron, described elsewhere.

17. T. Zamfirescu: *Typical simplicially convex bodies*,
Adv. Geom. 14 (2014), 109-115; **ISI**, IF= 0,314, RIS=0,860.

In this note we describe some geometrical properties that simplicially convex bodies typically enjoy. It is shown, for example, that they are nowhere dense and of measure zero. Moreover, they look at least half-dense from any of their points.

18. A. D. Jumani, C. T. Zamfirescu, **T. Zamfirescu**: *Lattice graphs with non-concurrent longest cycles*, Rend. Sem. Mat. Univ. Padova 132 (2014), 75-82; **ISI**, IF=0,265, RIS= 0,634.

No hypohamiltonian graphs are embeddable in the planar square lattice. This lattice contains, however, graphs in which every vertex is missed by some longest cycle. In this paper we present graphs with this property, embeddable in various lattices, and of remarkably small order.

19. J. Rouyer, C. Vîlcu: *The connected components of the space of Alexandrov surfaces*,
in: D. Ibadula and W. Veys (eds.), *Bridgind Algebra, Geometry and Topology*, Springer Proc. in Math. & Stat., vol. 96 (2014), 249-254; **IDB**.

Denote by *A(κ)* the set of all compact Alexandrov surfaces with curvature bounded below by κ without boundary, endowed with the topology induced by the Gromov–Hausdorff metric. We determine the connected components of *A(κ)* and of its closure.

20. K. Adiprasito, B. Benedetti: *The Hirsch conjecture holds for normal flag complexes*,
Math. Oper. Res. 39 (2014), 1340-1348; **ISI**, IF= 0,924, RIS= 2,516.

Using an intuition from metric geometry, we prove that any flag normal simplicial complex satisfies the non-revisiting path conjecture. As a consequence, the diameter of its facet-ridge graph is smaller than the number of vertices minus the dimension, as in the Hirsch conjecture. This proves the Hirsch conjecture for all ag polytopes, and more generally, for all (connected) flag homology manifolds.

21. K. Adiprasito: *Combinatorial stratifications and minimality of 2-arrangements*,
J. Topol. 7 (2014), 1200-1220; **ISI**, FI= 0,864, SRI= 2,630.

We prove that the complement of any ane 2-arrangement in R^d is minimal, that is, it is homotopy equivalent to a cell complex with as many i-cells as its i-th rational Betti number. For the proof, we provide a Lefschetz-type hyperplane theorem for complements of 2-arrangements, and introduce Alexander duality for combinatorial Morse functions. Our results greatly generalize previous work by Falk, Dimca-Papadima, Hattori, Randell, and Salvetti--Settepanella and others, and they demonstrate that in contrast to previous investigations, a purely combinatorial approach suces to show minimality and the Lefschetz Hyperplane Theorem for complements of complex hyperplane arrangements.

22. F. Nadeem, A. Shabbir, **T. Zamfirescu**: *Hamiltonian connectedness of Toeplitz graphs*,
in: P. Cartier et al. (eds.), *Mathematics in the 21st Century*, Springer Proc. in Math. & Stat., vol. 98 (2015), 135-149; **IBD**.

A Toeplitz graph is a graph with a Toeplitz adjacency matrix. In this paper we investigate the property of hamiltonian connectedness for some undirected Toeplitz graphs.

23. K. Adiprasito, T. Zamfirescu: *Few Alexandrov surfaces are Riemann*,
J. Nonlinear Convex Anal. 16 (2015) 1147-1153; **ISI**, IF=0,906, RIS= 0,537.

We demonstrate that, in most Alexandrov surfaces of curvature bounded below, most points are not interior to any geodesic. Thus, these surfaces are not Riemannian, in contrast to the “almost Riemannian” structure found by Otsu–Shioya in any Alexandrov space.

24. J. Rouyer, C. Vîlcu: *Simple closed geodesics on most Alexandrov surfaces*,
Adv. Math. 278 (2015), 103-120; **ISI**, IF=1,294, RIS= 3,004.

We study the existence of simple closed geodesics on most (in the sense of Baire category) Alexandrov surfaces with curvature bounded below, compact and without boundary. We show that it depends on both the curvature bound and the topology of the surfaces.

25. J. Itoh, **J. Rouyer, C. Vîlcu**: *Moderate smoothness of most Alexandrov surfaces*, Internat. J. Math. 26 (2015) 1540004 (14 pages); **ISI**, IF=0,597, RIS=1,121.

We show that, in the sense of Baire categories, a typical Alexandrov surface with curvature bounded below by κ has no conical points. We use this result to prove that, on such a surface (unless it is flat), at a typical point, the lower and the upper Gaussian curvatures are equal to κ and ∞ respectively.

26. J. Itoh, **J. Rouyer, C. Vîlcu**: *On the Theorem of the Three Perpendiculars*,
Elem. Math. 70 (2015), 71-78; **IDB**.

We show that the Theorem of the Three Perpendiculars holds in any finit-dimensional space form.

27. L. Montejano, **T. Zamfirescu**: When is a Disk Trapped by Four Lines?,
Graphs Combin. 31 (2015) 467-476; **ISI**, IF=0,388, RIS= 0,706.

We use homological and geometrical methods to study the problem of determining when a convex disk is trapped by four lines.

28. X. Feng, L. Yuan, **T. Zamfirescu**: *Acute Triangulations of Archimedean Surfaces. The Truncated Tetrahedron*,
Bull. Math. Soc. Sci. Math. Roumanie 58 (2015) 271-282; **ISI**, IF=0,521, RIS= 0,5.

In this paper we prove that the surface of the regular truncated tetrahedron can be triangulated into 10 non-obtuse geodesic triangles, and also into 12 acute geodesic triangles. Furthermore, we show that both triangulations have minimal size.

29. K. Adiprasito, R. Sanyal: *An Alexander-type duality for valuations*,
Proc. Amer. Math. Soc. 143 (2015), 833-843; **ISI**, IF=0,627, RIS=1,310.

We prove an Alexander-type duality for valuations for certain subcomplexes in the boundary of polyhedra. These strengthen and simplify results of Stanley (1974) and Miller-Reiner (2005). We give a generalization of Brion’s theorem for this relative situation and we discuss the topology of the possible subcomplexes for which the duality relation holds.

30. K. Adiprasito, B. Benedetti: *Tight complexes in 3-space admit perfect discrete Morse functions*,
Eur. J. Comb. 45 (2015), 71-84; **ISI**, IF=0,653, RIS=1,23.

In 1967, Chillingworth proved that all convex simplicial 3-balls are collapsible. Using the classical notion of tightness, we generalize this to arbitrary manifolds: We show that all tight simplicial 3-manifolds admit some perfect discrete Morse function. We also strengthen Chillingworth's theorem by proving that all convex simplicial 3-balls are non-evasive. In contrast, we show that many non-evasive 3-balls are not convex.

31. L. Yuan, **T. Zamfirescu**: *Right triple convex completion*,
J. Convex Analysis 22 (2015), 291-301; ISI, FI= 0,592, SRI= 0,850.

A set M in a Hilbert space is rt-convex if every pair of its points is included in a 3-point subset {x; y; z} of M making a right angle. We find here for various families of sets the minimal number of points necessary to add to the sets in order to render them rt-convex. For example, for convex bodies this number is at most 2.

32. T. Zamfirescu: *Escaping from a cage*,
Libertas Math. 35 (2015), 43-49; **IDB**.

This paper is about how to escape from a cage if you are a convex body.

33. L. Yuan, C. T. Zamfirescu, **T. Zamfirescu**: *Dissecting the square into five congruent parts*,
Discrete Math. 339 (2016), 288-298; **ISI**, IF=0,557, RIS= 0,765.

We give an affirmative answer to an old conjecture proposed by Ludwig Danzer: there is a unique dissection of the square into five congruent convex tiles.

34. A. Shabbir, **T. Zamfirescu**: *Gallai's property for graphs in lattices on the torus and the Moebius strip*,
Period. Math. Hungarica 72 (2016), 1-11; **ISI**, IF=0.261, RIS=0.

We prove the existence of graphs with empty intersection of their longest paths or cycles as subgraphs of lattices on the torus and the Möbius strip.

35. A. Shabbir, **T. Zamfirescu**: *Hamiltonicity in k-tree-Halin graphs*,
in K. Adiprasito et al. (eds.), *Convexity and Discrete Geometry Including Graph Theory*, Springer Proc. in Math. & Stat., vol. 148 (2016), 59-68; **IDB**.

A *k -tree-Halin graph* is a planar graph $F \cup C$, where F is a forest with at most k components and C is a cycle, such that $V(C)$ is the set of all leaves of F, C bounds a face and no vertex has degree 2. This is a generalization of Halin graphs. We are investigating here the hamiltonicity and traceability of k-tree-Halin graphs.

36. J. Rouyer: *Steinhaus conditions for convex polyhedra*,
in K. Adiprasito et al. (eds.), *Convexity and Discrete Geometry Including Graph Theory*, Springer Proc. in Math. & Stat., vol. 148 (2016), 77-84; **IDB**.

On a convex surface S, the antipodal map F associates to any point p in S the set of farthest points from p, with respect to the intrinsic metric. S is called a Steinhaus surface if F is a single-valued involution. We prove that any convex polyhedron has an open and dense set of points p admitting a unique antipode Fp, which in turn admits a unique antipode FFp, distinct from p. In particular, no convex polyhedron is Steinhaus.

37. N. Chevallier, A. Fruchard, **C. Vîlcu**: *Envelopes of α-sections*,
in K. Adiprasito et al. (eds.), *Convexity and Discrete Geometry Including Graph Theory*, Springer Proc. in Math. & Stat., vol. 148 (2016), 193-218; **IDB**.

Let K be a planar convex body af area $|K|$, and take $0<\alpha<1$. An α-section of K is a line cutting K into two parts, one of which has area $\alpha|K|$. This article presents a systematic study of the envelope of α-sections and its dependence on α. Several open questions are asked, one of them in relation to a problem of fair partitioning.

38. K. Adiprasito, A. Padrol: *A universality theorem for projectively unique polytopes and a conjecture of Shephard*,
Isr. J. Math. 211 (2016), 239-255; **ISI**, IF=0,659, RIS=1,469.

We prove that every polytope described by algebraic coordinates is the face of a projectively unique polytope. This provides a universality property for projectively unique polytopes. Using a closely related result of Below, we construct a combinatorial type of 5-dimensional polytope that is not realizable as a subpolytope of any stacked polytope. This disproves a classical conjecture in polytope theory, first formulated by Shephard in the seventies.

39. L. Yuan, **T. Zamfirescu**: *Right Triple Convexity*,
J. Convex Analysis 23 (2016), on-line; **ISI**, IF=0,786, RIS=0,850.

A set M in R^d is rt-convex if every pair of its points is included in a 3-point subset {x,y,z} of M such that the triangle with the corners x, y and z has a right angle at y. We characterize rt-convex sets, and for 2-connected polygonally connected sets, for 3-connected sets, for geometric graphs, and for finite sets.

40. L. Yuan, **T. Zamfirescu**, Y. Zhang: *Isosceles Triple Convexity*,
Carpathian J. Math. (2016), on-line; **ISI**, IF=0,610.

A set S in Rd is called it-convex if, for any two distinct points in S, there exists a third point in S, such that one of the three points is equidistant from the others. In this paper we first investigate nondiscrete it-convex sets, then discuss about the it-convexity of the eleven Archimedean tilings, and treat subsequently finite subsets of the square lattice. Finally, we obtain a lower bound on the number of isosceles triples contained in an n-point it-convex set.

41. K. Adiprasito, B. Benedetti: *Subdivisions, shellability, and collapsibility of products*,
Combinatorica (2016) on-line; **ISI**, IF=0,696, RIS=2,16.

We prove that the second derived subdivision of any rectilinear triangulation of any convex polytope is shellable. Also, we prove that the first derived subdivision of every rectilinear triangulation of any convex 3-dimensional polytope is shellable. This complements Mary Ellen Rudin's classical example of a non-shellable rectilinear triangulation of the tetrahedron. Our main tool is a new relative notion of shellability that characterizes the behavior of shellable complexes under gluing.

As a corollary, we obtain a new characterization of the PL property in terms of shellability: A triangulation of a sphere or of a ball is PL if and only if it becomes shellable after sufficiently many derived subdivisions. This improves on results by Whitehead, Zeeman and Glaser, and answers a question by Billera and Swartz.

We also show that any contractible complex can be made collapsible by repeatedly taking products with an interval. This strengthens results by Dierker and Lickorish, and resolves a conjecture of Oliver. Finally, we give an example that this behavior extends to non-evasiveness, thereby answering a question of Welker.

42. K. Adiprasito, R. Sanyal: *Relative Stanley-Reisner theory and Upper Bound Theorems for Minkowski sums*,
Publications Mathématiques de l'IHÉS (2016) on-line; **ISI**, IF=3,5.

In this paper we settle long-standing questions regarding the combinatorial complexity of Minkowski sums of polytopes: We give a tight upper bound for the number of faces of a Minkowski sum, including a characterization of the case of equality. We similarly give a (tight) upper bound theorem for mixed faces of Minkowski sums. This has a wide range of applications and generalizes the classical the Upper Bound Theorems of McMullen and Stanley.

Our main tool is relative Stanley–Reisner theory, a powerful generalization of the algebraic theory of simplicial complexes inaugurated by Hochster, Reisner, and Stanley. A key feature of our theory is the ability to accomodate topological as well as combinatorial restrictions. We illustrate this by providing several simplicial isoperimetric and reverse isoperimetric inequalities.

43. K. Adiprasito, B. Benedetti: *Metric geometry and collapsibility*, arXiv:1107.5789 [math.MG] (26 pages).

Collapsibility is a classical notion introduced by Whitehead as part of his simple homotopy theory. We provide several results relating it to metric geometry and convexity.

(1) Every complex that is CAT(0) with a metric for which all vertex stars are convex is collapsible.

(2) Any linear subdivision of any polytope is simplicially collapsible after one barycentric subdivision. This solves up to one derived subdivision a classical question by Lickorish.

(3) Any linear subdivision of any star-shaped polyhedron in R^s is simplicially collapsible after d-2 barycentric subdivisions at most. This presents progress on an old question by Goodrick.

We furthermore provide the following applications:

(1) Any simplicial complex admits a CAT(0) metric if and only if it admits collapsible triangulations.

(2) All contractible manifolds (except for some 4-dimensional ones) admit collapsible CAT(0) triangulations. This provides a polyhedral version of a classical result of Ancel and Guilbault.

(3) There are exponentially many geometric triangulations of S^d. This interpolates between the known result that boundaries of simplicial (d+1)-polytopes are exponentially many, and the conjecture that d-spheres are more than exponentially many.

(4) In terms of the number of facets, there are only exponentially many geometric triangulations of space forms with bounded geometry. This establishes a discrete version of Cheeger's finiteness theorem.

44. K. Adiprasito, A. Bjorner: *Filtered geometric lattices and Lefschetz Section Theorems over the tropical semiring*, arXiv:1401.7301 [math.AT] (37 pages).

The purpose of this paper is to establish analogues of the classical Lefschetz Section Theorem for smooth tropical varieties. More precisely, we prove tropical analogues of the section theorems of Lefschetz, Andreotti–Frankel, Bott–Milnor–Thom, Hamm–Lê and Kodaira–Spencer, and the vanishing theorems of Andreotti–Frankel and Akizuki–Kodaira–Nakano. We start the paper by resolving a conjecture of Mikhalkin and Ziegler (2008) concerning the homotopy Cohen–Macaulayness of certain filtrations of geometric lattices, generalizing earlier work on full geometric lattices by Folkman and others. This translates to a crucial index estimate for the stratified Morse data at critical points of the tropical variety, and it can also by itself be interpreted as a Lefschetz-type theorem for matroids.

45. J. Rouyer, C. Vîlcu: *Farthest points on most Alexandrov surfaces*, arXiv:1412.1465 [math.MG].

We study global maxima of distance functions on most Alexandrov surfaces with curvature bounded below, where most is used in the sense of Baire categories.

II. Talks at international conferences and workshops

1. T. Zamfirescu, *Moderation of convex bodies,* Convexity, Topology, Combinatorics and Beyond. Workshop in honour of Luis Montejano's 60th birthday, Puerto Vallarta, Mexico, October 2011.

2. T. Zamfirescu, *The fight between the circle and the square,* 5th International Conference on Research and Education in Mathematics, Bandung, Indonesia, October 2011.

3. T. Zamfirescu, *Against the Extremism in Convex Spaces*, An Encounter of Algebra and Geometry: A Sharing and Learning Conference; dedicated to Barbu Berceanu for his 60th birthday, Lahore, Pakistan, November 2011.

4. T. Zamfirescu, *Acute Triangulations*,
Spring Workshop on Recent Advances in Graph Theory and Combinatorics, Lahore, Pakistan, February 2012.

5. T. Zamfirescu, *Simplicial convexity*,
Szeged Workshop in Convex and Discrete Geometry, Szeged, Hungary, May 2012.

6. T. Zamfirescu, *Non-concurrent longest cycles in lattice graphs*, International Conference on the Mathematics of Distances and Applications, Varna, Bulgaria, July 2012.

7. T. Zamfirescu, *Non-expanding mappings and fixed points in graph theory*,
Fixed Point Theory and its Applications, Cluj-Napoca, Roumania, July 2012.

8. T. Zamfirescu, *Few Alexandrov surfaces are Riemann*,
The Fourth Geometry Meeting, dedicated to the centenary of A. D. Alexandrov, Saint-Petersburg, Russia, August 2012.

9. J. Rouyer, *Triangulations et approximations polyédriques des surfaces d'Alexandrov,*
10. C. Vîlcu, *Critical points for distance functions on surfaces,*
11. T. Zamfirescu, *Sur les chances de l'ordre allemand dans la réalité russe: Combien d'espaces d'Alexandrov sont-ils riemanniens?,*
Colloque de géométries, Mulhouse, France, September 2012.

12. T. Zamfirescu, *How many Alexandrov surfaces are Riemannian?,*
6th World Conference on 21st Century Mathematics 2013, Lahore, Pakistan, March 2013.

13. C. Vîlcu, *Baire categories for Alexandrov surfaces*,
International Conference. Experimental and Theoretical Methods in Algebra, Geometry and Topology, Eforie Nord, Roumania, June 2013.

14. T. Zamfirescu, *Cut locus and critical points,*
15. C. Vîlcu, *Two results concerning cut loci on surfaces,*
Anniversary Conference Faculty of Sciences - 150 years, Bucharest, Roumania, August - September 2013.

16. K. Adiprasito, *Combinatorial theory of "smooth" polytopes***,**
17. J. Rouyer, *Moderate smoothness of most Alexandrov surfaces,*
18. C. Vîlcu, *Simple closed geodesics on Alexandrov surfaces*,
12th International Conference on Discrete Mathematics: Discrete Geometry and Alexandrov surfaces, Bucharest, Roumania, September 2013.

19. J. Rouyer, *Geometry of most Alexandrov surfaces*,
20. C. Vîlcu, *Farthest points on most Alexandrov surfaces*,
4th Workshop for Young Researchers in Mathematics, Constanța, Roumania, May 2014.

21. J. Rouyer, *Geometry of most Alexandrov surfaces*,
Geometry Conference, Mulhouse, France, September 2014.

22. T. Zamfirescu, *Discs and other miscreants held in cages*,
Fifth International Conference on Combinatorics, Graph Theory, and Applications, Elgersburg, Germany, March 2015.

23. C. Vîlcu, *On the envelope of α-sections of a convex body*,
5th Workshop for Young Researchers in Mathematics, Constanța, Roumania, May 2015.

24. C. Vîlcu, *Baire categories for Alexandrov surfaces*, The Eighth Congress of Romanian Mathematicians, Iași, Roumania, June 2015.

25. J. Rouyer, *Simple closed geodesics on most Alexandrov Surfaces*, Geodesics and related topics, Kumamoto, Japan, January 2016.

26. J. Rouyer, *Antipodes on convex polyhedra*, Intuitive geometry, Kumamoto, Japan, February 2016.

Project Director,
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