

Publications

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Books

1. *A Short Course in Computational Geometry and Topology*. SpringerBriefs in Mathematical Methods, Heidelberg, Germany, 2014.
2. *Computational Topology: an Introduction* (with J. Harer). Amer. Math. Soc., Providence, Rhode Island, 2010.
3. *Geometry and Topology for Mesh Generation*. Cambridge Univ. Press, England, 2001.
4. *Algorithms in Combinatorial Geometry*. Springer-Verlag, Heidelberg, Germany, 1987. Translated into Japanese by Hiroshi Imai and Keiko Imai, Kyoritsu Shuppan, Japan, 1995.

Publications in Scientific Journals

1. The Morse theory of Čech and Delaunay complexes (with U. Bauer). *Trans. AMS*, to appear.
2. The classification of endoscopy images with persistent homology (with O. Dunaeva, A. Lukyanov, M. Machin, D. Malkova, R. O. Kuvaev and S. V. Kashin). *Pattern Recognition Letters*, to appear.
3. Approximation and convergence of the intrinsic volume (with F. Pausinger). *Adv. Math.* **287** (2016), 674–703.
4. Dynamic Roots: a software platform for the reconstruction and analysis of growing root plants (with O. Symonova and C. N. Topp). *PLoS One* **10** (2015), article number e0127657.
5. Triangulations from topologically correct digital Voronoi diagrams. (with T.-T. Cao and T.-S. Tan). *Comput. Geom.: Theory Appl.* **48** (2015), 507–419.
6. The Voronoi functional is maximized by the Delaunay triangulation in the plane (with A. Glazyrin, O. R. Musin and A. Nikitenko). *Combinatorica* (2015), to appear.
7. The persistent homology of a self-map (with G. Jabłoński and M. Mrozek). *Found. Comput. Math.* **15** (2015), 1213–1244.
8. Novel computer technologies for the prediction of histological structure in the stomach (with R. O. Kuvaev, S. V. Kashin, V. A. Kapranov, M. L. Myachin, O. A. Dunaeva and A. I. Rusakov). *Evidence-based Gastroenterology* **1** (2013), 3–12.
9. An algorithm for geometric simplification of a set of lines by topology preserving edge contractions (with T. E. Samsonov, O. P. Yakimova, V. V. Alekseev, V. G. Bogaevskaya, A. A. Gorohov, V. N. Knyazev, M. M. Preobrazhenskaya, and A. Yu. Ukhalov). *J. Geodesy and Cartography* **3** (2014), 29–36.
10. An algorithm for cartographic generalization that preserves global topology (with V. V. Alexeev, V. G. Bogaevskaya, M. M. Preobrazhenskaya, A. Yu. Ukhalov, and O. P. Yakimova). *Fundamentalnaya i Prikladnaya Matematika (Fund. Appl. Math.)* **18** (2013), 5–12, English translation in *J. Math. Sci.* **203** (2014), 754–760.
11. 3D phenotyping and quantitative trait locus mapping identify core regions of the rice genome controlling root architecture (with C. N. Topp, A. S. Iyer-Pascuzzi, J. T. Anderson, C.-R. Lee, P. R. Zurec, O. Symonova, Y. Zheng, A. Bucksch, Y. Mileyko, T. Galkovskyi, B. T. Moore, J. Harer, T. Mitchell-Olds, J. S. Weitz and P. N. Benfey). *Proc. Natl. Acad. Sci.* **110** (2013), E1695–E1704.
12. Genotypic recognition and spatial responses by rice roots (with S. Fang, R. T. Clark, Y. Zheng, A. S. Iyer-Pascuzzi, J. S. Weitz, L. V. Kochian, H. Liao and P. N. Benfey). *Proc. Natl. Acad. Sci.* **110** (2013), 2670–2675.

13. Stable length estimates of tube-like shapes (with F. Pausinger). *J. Math. Imaging Vision* **50** (2014), 164–177.
14. Add isotropic Gaussian kernels at own risk: more and more resilient modes in higher dimensions (with B. Fasy and G. Rote). *Discrete Comput. Geom.* **49** (2013), 797–822.
15. On the configuration space of Steiner minimal trees (with N. Strelkova). *Uspekhi Mat. Nauk* **67** (2012), 203–204, translated into English in *Russian Math. Surveys* **67** (2012), 1167–1168.
16. Current open problems in discrete and computational geometry (with A. Ivanov and R. Karasev). *Modeling and Analysis of Information Systems* **12** (2012), 5–17, English version to appear in *J. Autom. Control Comput. Sci.*,
17. Functionals on triangulations of Delaunay sets (with N. P. Dolbilin, A. Glazyrin and O. R. Musin). *Moscow Math. J.* **14** (2014), 491–504.
18. On the optimality of functionals over triangulations of Delaunay sets (with N. P. Dolbilin and O. R. Musin). *Comm. Moscow Math. Soc.* **67** (2012), 189–190, English translation, 781–783.
19. Fractal and computational geometry for generalizing cartographic objects (with O. Musin, A. Ukhalov, O. Yakimova, V. Alexeev, V. Bogaevskaya, A. Gorohov and M. Preobrazhenskaya). *Modeling and Analysis of Information Systems* **19** (2012), 152–160, English version to appear in *J. Autom. Control Comput. Sci.*,
20. The Medusa of spatial sorting: topological construction (with C.-P. Heisenberg, M. Kerber and G. Krens). Archived manuscript at arxiv.org/abs/1207.6474, 2012.
21. Probing dark energy with alpha shapes and Betti numbers (with R. v. d. Weygaert, P. Pranav, B. J. T. Bernard, E. G. P. Box, G. Vegter, W. Hellwing and C. Park). Manuscript, submitted to *Astrophysical Journal Letters*, 2012.
22. Hierarchical ordering of reticular networks (with Y. Mileyko, C. A. Prize and J. Weitz). *PLoS One* **7** (2012), e36715.
23. A point calculus for interlevel set homology (with P. Bendich and S. Cabello). *Pattern Recogn. Lett.* **33** (2012), 1436–1444.
24. Computing elevation maxima by searching the Gauss sphere (with B. Wang and D. Morozov). *ACM J. Exper. Alg.* **16** (2011), 1–13.
25. Dual complexes of cubical subdivisions of R^n (with M. Kerber). *Discrete Comput. Geom.* **47** (2012), 393–414.
26. Homology and robustness of level and interlevel sets (with P. Bendich, D. Morozov and A. Patel). *Homology, Homotopy, and Applications* **15** (2013), 51–72.
27. Computing robustness and persistence for images (with P. Bendich and M. Kerber). *IEEE Trans. Visual. Comput. Graphics* **16** (2010), 1251–1260.
28. Quantifying transversality by measuring robustness of intersections (with D. Morozov and A. Patel). *Found. Comput. Math.* **11** (2011), 345–361.
29. Lipschitz functions have L_p -stable persistence (with D. Cohen-Steiner, J. Harer and Y. Mileyko). *Found. Comput. Math.* **10** (2010), 127–139.
30. Extending persistence using Poincaré and Lefschetz duality (with D. Cohen-Steiner and J. Harer). *Found. Comput. Math.* **9** (2009), 79–103. Erratum on pages 133–134.
31. Comparison of pattern detection methods in microarray time series of the segmentation clock (with M.-L. Dequèant, S. Ahnert, T. M. A. Fink, E. F. Glynn, G. Hattem, A. Kudlicki, Y. Mileyko, J. Morton, A. R. Mushegian, L. Pachter, M. Rowicka, A. Shiu, B. Sturmfels and O. Pourquié). *PLoS One* **3** (2008), e2856.
32. Time-varying Reeb graphs for continuous space-time data (with J. Harer, A. Mascarenhas, V. Pascucci and J. Snoeyink). *Comput. Geom. Theory Appl.* **41** (2008), 149–166.
33. Protein-protein interfaces: properties, preferences, and projections (with J. Headd, Y.-H. A. Ban, P. Brown, M. Vaidya and J. Rudolph). *J. Proteome Research* **6** (2007), 2576–2586.
34. Inclusion-exclusion formulas from independent complexes (with D. Attali). *Discrete Comput. Geom.* **37** (2007), 59–77.
35. Inequalities for the curvature of curves and surfaces (with D. Cohen-Steiner). *Found. Comput. Math.* **7** (2007), 391–404.
36. Stability of persistence diagrams (with D. Cohen-Steiner and J. Harer). *Discrete Comput. Geom.* **37** (2007), 103–120.

37. Evaluating the quality of NMR structures by local density of protons (with Y.-H. A. Ban, J. Rudolph and P. Zhou). *Proteins: Structure, Function, and Bioinformatics* **62** (2006), 852–864.
38. Extreme elevation on a 2-manifold (with P. K. Agarwal, J. Harer and Y. Wang). *Discrete Comput. Geom.* **36** (2006), 553–572.
39. Interface surfaces for protein-protein complexes (with Y.-H. A. Ban and J. Rudolph). *J. Assoc. Comput. Mach.* **53** (2006), 361–378.
40. Experimental validation of the docking orientation of Cdc25 with its Cdk2-CycA protein substrate (with J. Sohn, J. Parks, G. Buhrman, P. Brown, K. Kristjánsson, A. Safi, W. Yang and J. Rudolph). *Biochemistry* **44** (2005), 16563–16573.
41. Loops in Reeb graphs of 2-manifolds (with K. Cole-McLaughlin, J. Harer, V. Natarajan and V. Pascucci). *Discrete Comput. Geom.* **32** (2004), 231–244.
42. Topological hierarchy for functions on triangulated surfaces (with P.-T. Bremer, B. Hamann and V. Pascucci). *IEEE Trans. Vis. Comput. Graphics* **10** (2004), 385–396.
43. Simplification of three-dimensional density maps (with V. Natarajan). *IEEE Trans. Visual. Comput. Graphics* **10** (2004), 587–597.
44. Computing the writhing number of a polygonal knot (with P. Agarwal and Y. Wang). *Discrete Comput. Geom.* **32** (2004), 37–53.
45. The area derivative of a space-filling diagram (with R. Bryant, P. Koehl and M. Levitt). *Discrete Comput. Geom.* **32** (2004), 293–308.
46. The weighted volume derivative of a space-filling diagram (with P. Koehl). *Proc. Natl. Acad. Sci.* **100** (2003), 2203–2208.
47. Hierarchical Morse-Smale complexes for piecewise linear 2-manifolds (with J. Harer and A. Zomorodian). *Discrete Comput. Geom.* **30** (2003), 87–107.
48. Area, perimeter and derivatives of a skin curve (with H.-L. Cheng). *Comput. Geom. Theory Appl.* **26** (2003), 173–192.
49. Computing linking numbers of a filtration (with A. Zomorodian). *Homology, Homotopy, and Applications* **5** (2003), 19–37.
50. Algorithmic issues in modeling motion (with P. K. Agarwal, L. J. Guibas, J. Erickson, M. Isard, S. Har-Peled, J. Hershberger, C. Jensen, L. Kavraki, P. Koehl, M. Lin, D. Minocha, D. Metaxas, B. Mirtich, D. Mount, S. Muthukrishnan, D. Pai, E. Sacks, J. Snoeyink, S. Suri and O. Wolfson). *ACM Computing Surveys* **34** (2002), 550–572.
51. Topological persistence and simplification (with D. Letscher and A. Zomorodian). *Discrete Comput. Geom.* **28** (2002), 511–533.
52. An experimental study of sliver exudation (with D. Guoy). *Engin. with Comput.* **18** (2002), 229–240.
53. Sink-insertion for mesh improvement (with D. Guoy). *Internat. J. Found. Comput. Sci.* **13** (2002), 223–242.
54. Fast software for box intersections (with A. Zomorodian). *Internat. J. Comput. Geom. Appl.* **12** (2002), 143–172.
55. 180 wrapped tubes. *J. Univ. Comput. Sci.* **7** (2001), 379–399.
56. Dynamic skin triangulation (with H.-L. Cheng, T. K. Dey and J. Sullivan). *The Micha Sharir Birthday Issue*, eds. P. Agarwal, D. Halperin and R. Pollack, *Discrete Comput. Geom.* **25** (2001), 525–568.
57. Shape space from deformation (with H.-L. Cheng and P. Fu.) *Comput. Geom. Theory Appl.* **19** (2001), 191–204.
58. Design and analysis of planar shape deformation (with S.-W. Cheng, P. Fu and P. Lam). *Comput. Geom. Theory Appl.* **19** (2001), 205–218.
59. Triangulations and meshes in computational geometry. *Acta Numerica* (2000), 133–213.
60. Edgewise subdivision of a simplex (with D. R. Grayson). *Discrete Comput. Geom.* **24** (2000), 707–719.
61. Sliver exudation (with S.-W. Cheng, T. K. Dey, M. A. Facello and S.-H. Teng). *J. Assoc. Comput. Mach.* **47** (2000), 883–904.
62. Adaptive simplicial grids from cross-sections of monotone complexes (with R. Waupotitsch). *Internat. J. Comput. Geom. Appl.* **10** (2000), 267–284.

63. Topology preserving edge contraction (with T. K. Dey, S. Guha and D. V. Nekhayev). *Publ. Inst. Math. (Beograd) (N. S.)* **66** (1999), 23–45.
64. Deformable smooth surface design. *Discrete Comput. Geom.* **21** (1999), 87–115.
65. Anatomy of protein pockets and cavities: measurement of binding site geometry and implications for ligand design (with J. Liang and C. Woodward). *Protein Science* **7** (1998), 1884–1897.
66. Analytic shape computation of macromolecules II: inaccessible cavities in proteins (with J. Liang, P. Fu, P. V. Sudhakar and S. Subramaniam). *Proteins: Structure, Function, and Genetics* **33** (1998), 18–29.
67. Analytic shape computation of macromolecules I: molecular area and volume through alpha shape (with J. Liang, P. Fu, P. V. Sudhakar and S. Subramaniam). *Proteins: Structure, Function, and Genetics* **33** (1998), 1–17.
68. On the definition and the construction of pockets in macromolecules (with M. Facello and J. Liang). *Discrete Appl. Math.* **88** (1998), 83–102.
69. A combinatorial approach to cartograms (with R. Waupotitsch). *J. Comput. Geom. Theory Appl.* **7** (1997), 343–360.
70. Inclusion-exclusion complexes for pseudodisk collections (with E. A. Ramos). *Discrete Comput. Geom.* **17** (1997), 287–306.
71. Cutting dense point sets in half (with P. Valtr and E. Welzl). *Discrete Comput. Geom.* **17** (1997), 243–255.
72. Triangulating topological spaces (with N. R. Shah). *Internat. J. Comput. Geom. Appl.* **7** (1997), 365–378.
73. Viewing geometric protein structures from inside a CAVE (with N. Akkiraju, P. Fu and J. Qian). *IEEE Comput. Graphics Appl.* **16** (1996), 58–61.
74. Triangulating the surface of a molecule (with N. Akkiraju). *Discrete Appl. Math.* **71** (1996), 5–22.
75. Incremental topological flipping works for regular triangulations (with N. R. Shah). *Algorithmica* **15** (1996), 223–241.
76. Lines in space: combinatorics and algorithms (with B. Chazelle, L. J. Guibas, M. Sharir and J. Stolfi). *Algorithmica* **15** (1996), 428–447.
77. An incremental algorithm for Betti numbers of simplicial complexes on the 3-sphere (with C. J. A. Delfinado). *Comput. Aided Geom. Design* **12** (1995), 771–784.
78. The union of balls and its dual shape. *László Fejes Tóth Festschrift*, eds. I. Bárány and J. Pach, *Discrete Comput. Geom.* **13** (1995), 415–440.
79. Improved bounds on weak ε -nets for convex sets (with B. Chazelle, M. Grigni, L. J. Guibas, M. Sharir and E. Welzl). *Discrete Comput. Geom.* **13** (1995), 1–15.
80. Counting triangle crossings and halving planes (with T. R. Dey). *Discrete Comput. Geom.* **12** (1994), 281–289.
81. Three-dimensional alpha shapes (with E. P. Mücke). *ACM Trans. Graphics* **13** (1994), 43–72.
82. Ray shooting in polygons using geodesic triangulations (with B. Chazelle, M. Grigni, L. J. Guibas, J. E. Hersberger, M. Sharir and J. Snoeyink). *Algorithmica* **12** (1994), 54–68.
83. Algorithms for bichromatic line-segment problems and polyhedral terrains (with B. Chazelle, L. J. Guibas and M. Sharir). *Algorithmica* **11** (1994), 116–132.
84. Selecting heavily covered points (with B. Chazelle, L. J. Guibas, J. E. Hersberger, R. Seidel and M. Sharir). *SIAM J. Comput.* **23** (1994), 1138–1151.
85. Diameter, width, closest line pair, and parametric searching (with B. Chazelle, L. J. Guibas and M. Sharir). *Discrete Comput. Geom.* **10** (1993), 183–196.
86. An upper bound for conforming Delaunay triangulations (with T. S. Tan). *Discrete Comput. Geom.* **10** (1993), 197–213.
87. A quadratic time algorithm for the minmax length triangulation (with T. S. Tan). *SIAM J. Comput.* **22** (1993), 527–551.
88. Edge insertion for optimal triangulations (with M. Bern, D. Eppstein, S. Mitchell and T. S. Tan). *Discrete Comput. Geom.* **10** (1993), 47–65.
89. Computing a face in an arrangement of line segments and related problems (with B. Chazelle, L. J. Guibas, M. Sharir and J. Snoeyink). *SIAM J. Comput.* **22** (1993), 1286–1302.

90. On the zone theorem for hyperplane arrangements (with R. Seidel and M. Sharir). *SIAM J. Comput.* **22** (1993), 418–429.
91. Optimal time bounds for some proximity problems in the plane (with A. Aggarwal, P. Raghavan and P. Tiwari). *Inform. Process. Lett.* **42** (1992), 55–60.
92. An $O(n^2 \log n)$ time algorithm for the minmax angle triangulation (with T. S. Tan and R. Waupotitsch). *SIAM J. Sci. Stat. Comput.* **13** (1992), 994–1008.
93. The number of edges of many faces in a line segment arrangement (with B. Aronov, L. J. Guibas and M. Sharir). *Combinatorica* **12** (1992), 261–274.
94. Counting and cutting cycles of lines and rods in space (with B. Chazelle, L. J. Guibas, R. Pollack, R. Seidel, M. Sharir, J. Snoeyink). *Computational Geometry: Theory and Applications* **1** (1992), 305–323.
95. Arrangements of curves in the plane - topology, combinatorics, and algorithms (with L. J. Guibas, J. Pach, R. Pollack, R. Seidel and M. Sharir). *Theoret. Comput. Sci.* **92** (1992), 319–336.
96. An optimal algorithm for intersecting line segments in the plane (with B. Chazelle). *J. Assoc. Comput. Mach.* **39** (1992), 1–54.
97. Points and triangles in the plane and halving planes in space (with B. Aronov, B. Chazelle, L. J. Guibas, M. Sharir and R. Wenger). *Discrete Comput. Geom.* **6** (1991), 435–442.
98. Euclidean minimum spanning trees and bichromatic closest pairs (with P. K. Agarwal, O. Schwarzkopf and E. Welzl). *Discrete Comput. Geom.* **6** (1991), 407–422.
99. An $O(n \log^2 h)$ time algorithm for the three-dimensional convex hull problem (with W. Shi). *SIAM J. Comput.* **20** (1991), 259–269.
100. A singly exponential stratification scheme for real semi-algebraic varieties and its applications (with B. Chazelle, L. J. Guibas and M. Sharir). *Theoret. Comput. Sci.* **84** (1991), 77–105.
101. A lower bound on the number of unit distances between the vertices of a convex polygon (with P. Hajnal). *J. Combin. Theory Ser. A* **56** (1991), 312–316.
102. Ranking intervals under visibility constraints (with M. H. Overmars, E. Welzl, I. Ben-Arroyo Hartman and J. A. Feldman). *Internat. J. Comput. Math.* **34** (1990), 129–144.
103. Tetrahedrizing point sets in three dimensions (with F. P. Preparata and D. B. West). *J. Symbolic Comput.* **10** (1990), 335–347.
104. The complexity of many cells in arrangements of planes and related problems (with L. J. Guibas and M. Sharir). *Discrete Comput. Geom.* **5** (1990), 197–216.
105. The complexity and construction of many faces in arrangements of lines and of segments (with L. J. Guibas and M. Sharir). *Discrete Comput. Geom.* **5** (1990), 161–196.
106. Combinatorial complexity bounds for arrangements of curves and spheres (with K. L. Clarkson, L. G. Guibas, M. Sharir and E. Welzl). *Discrete Comput. Geom.* **5** (1990), 99–160.
107. An acyclicity theorem for cell complexes in d dimensions. *Combinatorica* **10** (1990), 251–260.
108. Computing least median of squares regression lines and guided topological sweep (with D. L. Souvaine). *J. Amer. Statist. Assoc.* **85** (1990), 115–119.
109. Searching for empty convex polygons (with D. P. Dobkin and M. H. Overmars). *Algorithmica* **5** (1990), 561–571.
110. Simulation of simplicity: a technique to cope with degenerate cases in geometric algorithms (with E. P. Mücke). *ACM Trans. Graphics* **9** (1990), 66–104.
111. Covering convex sets with non-overlapping polygons (with A. D. Robison and X. J. Shen). *Discrete Math.* **81** (1990), 153–164.
112. The maximum number of ways to stab n convex nonintersecting sets in the plane is $2n - 2$ (with M. Sharir). *Discrete Comput. Geom.* **5** (1990), 35–42.
113. Implicitly representing arrangements of lines or segments (with L. J. Guibas, J. Hershberger, R. Seidel, M. Sharir, J. Snoeyink and E. Welzl). *Discrete Comput. Geom.* **4** (1989), 433–466.
114. On arrangements of Jordan arcs with three intersections per pair (with L. J. Guibas, J. Hershberger, J. Pach, R. Pollack, R. Seidel, M. Sharir and J. Snoeyink). *Discrete Comput. Geom.* **4** (1989), 523–539.

115. Partitioning space for range queries (with F. F. Yao, D. P. Dobkin, and M. S. Paterson) *SIAM J. Comput.* **18** (1989), 371–384.
116. Circles through two points that always enclose many points (with N. Hasan, R. Seidel and X. J. Shen). *Geometriae Dedicata* **32** (1989), 1–12.
117. The upper envelope of piecewise linear functions: tight bounds on the number of faces. *Discrete Comput. Geom.* **4** (1989), 337–343.
118. The upper envelope of piecewise linear functions: algorithms and applications (with L. J. Guibas and M. Sharir). *Discrete Comput. Geom.* **4** (1989), 311–336.
119. Testing the necklace condition for shortest tours and optimal factors in the plane (with G. Rote and E. Welzl). *Theoret. Comput. Sci.* **66** (1989), 157–180.
120. The complexity of cutting complexes (with B. Chazelle and L. J. Guibas). *Discrete Comput. Geom.* **4** (1989), 139–182.
121. On the number of furthest neighbour pairs in a point set (with S. S. Skiena). *Amer. Math. Monthly* **96** (1989), 614–618.
122. Topologically sweeping an arrangement (with L. J. Guibas). *J. Comput. System Sci.* **38** (1989), 165–194. Corrigendum. *J. Comput. System Sci.* **42** (1991), 249–251.
123. Probing convex polygons with x-rays (with S. S. Skiena). *SIAM J. Comput.* **17** (1988), 870–882.
124. Minimum polygonal separation (with F. P. Preparata). *Inform. and Comput.* **77** (1988), 218–232.
125. A tight lower bound on the size of visibility graphs (with X. J. Shen). *Inform. Process. Lett.* **26** (1987), 61–64.
126. Linear space data structures for two types of range search (with B. Chazelle). *Discrete Comput. Geom.* **2** (1987), 113–126.
127. An improved algorithm for constructing k^{th} -order Voronoi diagrams (with B. Chazelle). *IEEE Trans. Comput.* **C-36** (1987), 1349–1354.
128. Zooming by repeated range detection (with M. H. Overmars). *Inform. Process. Lett.* **24** (1987), 413–417.
129. Space searching for intersecting objects (with D. P. Dobkin). *J. Algorithms* **8** (1987), 348–361.
130. Computing a ham-sandwich cut in two dimensions (with R. Waupotitsch). *J. Symbolic Comput.* **2** (1986), 171–178.
131. Voronoi diagrams and arrangements (with R. Seidel). *Discrete Comput. Geom.* **1** (1986), 25–44.
132. The number of extreme pairs of finite point-sets in Euclidean spaces (with G. Stöckl). *J. Combin. Theory Ser. A* **43** (1986), 344–349.
133. Edge-skeletons in arrangements with applications. *Algorithmica* **1** (1986), 93–109.
134. The complexity of cells in three-dimensional arrangements (with D. Haussler). *Discrete Math.* **60** (1986), 139–146.
135. Constructing arrangements of lines and hyperplanes with applications (with J. O’Rourke and R. Seidel). *SIAM J. Comput.* **15** (1986), 341–363.
136. How often can you see yourself in a convex configuration of mirrors? (with J. W. Jaromczyk). *Congressus Numerantium* **53** (1986), 193–200.
137. Rectangular point location in d dimensions with applications (with G. Haring and D. Hilbert). *Comput. J.* **29** (1986), 76–82.
138. Optimal point location in a monotone subdivision (with L. J. Guibas and J. Stolfi). *SIAM J. Comput.* **15** (1986), 317–340.
139. Halfplanar range search in linear space and $O(n^{0.695})$ query time (with E. Welzl). *Inform. Process. Lett.* **23** (1986), 289–293.
140. On the maximal number of edges of many faces in an arrangement (with E. Welzl). *J. Combin. Theory Ser. A* **41** (1986), 159–166.
141. Constructing belts in two-dimensional arrangements with applications (with E. Welzl). *SIAM J. Comput.* **15** (1986), 271–284.

142. Optimal solutions for a class of point retrieval problems (with B. Chazelle). *J. Symbolic Comput.* **1** (1985), 47–56.
143. Investigation of proportional link linkage clustering methods (with W. H. E. Day). *J. Classification* **2** (1985), 239–254.
144. Finding extreme points in three dimensions and solving the post-office problem in the plane (with H. A. Maurer). *Inform. Process. Lett.* **21** (1985), 39–47.
145. Batched dynamic solutions to decomposable searching problems (with M. H. Overmars). *J. Algorithms* **6** (1985), 515–542.
146. On the number of line separations of a finite set in the plane (with E. Welzl). *J. Combin. Theory Ser. A* **38** (1985), 15–29.
147. Computing the extreme distances between two convex polygons. *J. Algorithms* **6** (1985), 213–224.
148. Finding transversals for sets of simple geometric figures. *Theoret. Comput. Sci.* **35** (1985), 55–69.
149. Efficient algorithms for agglomerative hierarchical clustering methods (with W. H. E. Day). *J. Classification* **1** (1984), 7–24.
150. Some methods of computational geometry applied to computer graphics (with M. H. Overmars and R. Seidel). *Comput. Vision, Graphics, Image Process.* **28** (1984), 92–108.
151. Stationing guards in rectilinear art galleries (with J. O’Rourke and E. Welzl). *Comput. Vision, Graphics, Image Process.* **28** (1984), 167–176.
152. An optimal algorithm for constructing the weighted Voronoi diagram in the plane (with F. Aurenhammer). *Pattern Recognition* **17** (1984), 251–257.
153. Computing the connected components of simple rectilinear geometrical objects in d -space (with J. v. Leeuwen, Th. Ottmann and D. Wood). *RAIRO Inform. Theor.* **18** (1984), 171–183.
154. On the shape of a set of points in the plane (with D. G. Kirkpatrick and R. Seidel). *IEEE Trans. Inform. Theory* **IT-29** (1983), 551–559.
155. A new approach to rectangle intersections – part II. *Internat. J. Comput. Math.* **13** (1983), 221–229.
156. A new approach to rectangle intersections – part I. *Internat. J. Comput. Math.* **13** (1983), 209–219.
157. Stabbing line segments (with H. A. Maurer, F. P. Preparata, A. L. Rosenberg, E. Welzl and D. Wood). *BIT* **22** (1982), 274–281.
158. On the equivalence of some rectangle problems (with M. H. Overmars). *Inform. Process. Lett.* **14** (1982), 124–127.
159. Polygonal intersection searching (with D. G. Kirkpatrick and H. A. Maurer). *Inform. Process. Lett.* **14** (1982), 74–79.
160. A space-optimal solution of general region location (with H. A. Maurer). *Theoret. Comput. Sci.* **16** (1981), 329–336.
161. On the intersection of orthogonal objects (with H. A. Maurer). *Inform. Process. Lett.* **13** (1981), 177–181.

Publications in Books

1. Alpha, Betti and the Megaparsec Universe: on the topology of the cosmic web (with R. v. d. Weygaert, G. Vegter, B. J. T. Jones, P. Pranav, C. Park, W. A. Hellwing, B. Eldering, N. Kruithof, E. G. P. Bos, J. Hidding, J. Feldbrugge, E. ten Have, M. van Engelen, M. Caroli and M. Teillaud). *Trans. Comput. Sci.* **XIV**, Lecture Notes Comput. Sci. **6970** (2011), 60–101.
2. Covering and packing with spheres by diagonal distortion in R^n (with M. Kerber). *Rainbow of Computer Science*, 20–35, eds. C. S. Calude, G. Rozenberg and A. Salomaa, Lecture Notes in Computer Science **6570**, Springer-Verlag, Heidelberg, Germany, 2011.
3. Alpha shapes — a survey. *Tessellations in the Sciences: Virtues, Techniques and Applications of Geometric Tilings* **27**, ed. R. van de Weygaert, G. Vegter, J. Ritzerveld and V. Icke, to appear.
4. The stability of the apparent contour of an orientable 2-manifold (with D. Morozov and A. K. Patel). *Topological Data Analysis and Visualization*, 27–42, eds. V. Pascucci, X. Tricoche, H. Hagen and J. Tierny, Springer-Verlag, Heidelberg, Germany, 2011.

5. Stability and computation of medial axes: a state-of-the-art report (with D. Attali and J.-D. Boissonnat). *Mathematical Foundations of Scientific Visualization, Computer Graphics, and Massive Data Exploration*, eds. T. Möller, B. Hamann and R. Russell, 109–125, Springer-Verlag, Berlin, Germany, 2009.
6. Persistent homology — a survey (with J. Harer). *Surveys on Discrete and Computational Geometry. Twenty Years Later*, eds. J. E. Goodman, J. Pach and R. Pollack, Contemporary Mathematics **453**, 257–282, Amer. Math. Soc., Providence, Rhode Island, 2008.
7. Skeletal structures (with S. Biasotti, D. Attali, J.-D. Boissonnat, G. Elber, M. Mortara, G. Sanniti di Baja, M. Spagnuolo, M. Tanase and R. Velcamp). *Shape Analysis and Structuring*, 145–183, eds. L. De Floriani and M. Spagnuolo, Springer-Verlag, Berlin, Germany, 2008.
8. The geometry of biomolecular solvation (with P. Koehl). *Combinatorial and Computational Geometry*, 243–275, eds. J. E. Goodman, J. Pach and E. Welzl, MSRI Publ. **52**, Cambridge Univ. Press, England, 2005.
9. Jacobi sets of multiple Morse functions (with J. Harer). *Foundations of Computational Mathematics, Minneapolis 2002*, 37–57, eds. F. Cucker, R. DeVore, P. Olver, E. Süli, Cambridge Univ. Press, England, 2004.
10. Biological applications of computational topology. *Handbook of Discrete and Computational Geometry*, 1395–1412, eds. J. E. Goodman and J. O’Rourke, CRC Press, Boca Raton, Florida, 2004.
11. Area and perimeter derivatives of a union of disks (with H.-L. Cheng). *Computer Science in Perspective. Essays Dedicated to Thomas Ottmann*, 88–97, eds. R. Klein, H.-W. Six and L. Wegner, Lecture Notes in Computer Science **2598**, Springer-Verlag, 2003.
12. Surface reconstruction by wrapping finite sets in space. *Discrete and Computational Geometry — The Goodman-Pollack Festschrift*, 379–404, eds. B. Aronov, S. Basu, J. Pach and M. Sharir, Springer-Verlag, Berlin, 2003.
13. Spielereien mit Kreisen und Kugeln. Zum Thema Form und Verformung. *Zur Kunst des formalen Denkens*, 153–171, eds. R. E. Burkard, W. Maas und P. Weibel, Passagen Verlag, Wien, Austria, 2000.
14. Computational topology (with T. K. Dey and S. Guha). *Advances in Discrete and Computational Geometry*, 109–143, eds.: B. Chazelle, J. E. Goodman and R. Pollack, Contemporary Mathematics **223**, AMS, Providence, 1999.
15. Auditory Morse analysis of triangulated manifolds (with U. Axen). *Mathematical Visualization*, 223–236, eds. H.-C. Hege and K. Polthier, Springer-Verlag, Berlin, Germany, 1998.
16. Geometry for modeling biomolecules. *Robotics: The Algorithmic Perspective*, The Third Workshop on the Algorithmic Foundations of Robotics, 265–277, ed.: P. Agarwal, L. Kavraki and M. Mason, A. K. Peters, Natick, Massachusetts, 1998.
17. Computational geometry. Chapter 1 in *Current Trends in Theoretical Computer Science, Essays and Tutorials*, 1–48, ed.: G. Rozenberg and A. Salomaa, World Scientific, Singapore, 1993.
18. Geometric algorithms. Chapter 2.9 in *Handbook of Convex Geometry*, 699–735, ed.: P. Gruber and J. Wills, North-Holland, 1992.
19. Lines in space – a collection of results. *Discrete and Computational Geometry*, 77–93, ed.: R. Pollack and W. Steiger, DIAMCS Series in Discrete Mathematics and Theoretical Computer Science, vol. 6, 1991.
20. A hyperplane incidence problem with applications to counting distances (with M. Sharir). *Applied Geometry and Discrete Mathematics. The Victor Klee Festschrift*, 253–263, eds.: P. Gritzmann and B. Sturmfels, DIMACS Series in Discrete Mathematics and Theoretical Computer Science, 1991.
21. Probing convex polytopes (with D. P. Dobkin and C. K. Yap). *Autonomous Robot Vehicles*, 328–341, ed.: I. J. Cox and G. T. Wilfong, Springer-Verlag, New York, 1990.
22. Neue Entwicklungen im Bereich Datenstrukturen. *Überblicke Informationsverarbeitung 1983*, 55–109, ed.: H. A. Maurer, BI Wissenschaftsverlag, Mannheim, Germany.
23. Graphics in Flatland: a case study (with M. H. Overmars and D. Wood). *Advances in Computing Research*, **Vol. 1**, 35–59, ed.: F. P. Preparata, Jai Press, London, 1983.
24. On expected- and worst-case segment trees (with W. Bucher). *Advances in Computing Research* **Vol. 1**, 109–125, ed.: F. P. Preparata, Jai Press, London, 1983.

Publications in Conference Proceedings (not also available in journals)

1. Relaxed disk packing (with M. Iglesias-Ham and V. Kurlin). *In* “Proc. 27th Canadian Conf. Comput. Geom. 2015”.
2. On the computational complexity of Betti numbers: reduction from matrix rank (with S. Parsa). *In* “Proc. 25th ACM-SIAM Sympos. Discrete Alg., 2014”, 152–160.
3. 3D kinetic alpha complexes and their implementation (with M. Kerber). *In* “Proc. Mtg. Alg. Engin. Exp., 2013”, 70–77.
4. Methods of fractal and computational geometry for generalization of linear cartographic objects (with O. Musin, A. Ukhlov, O. Yakimova, V. Alexeev, V. Bogaevskaya, A. Gorohov and M. Preobrazhenskaya). *In* “Proc. 100th Birthday of A. D. Alexandrov Meeting, 2012”, to appear.
5. Persistent homology: theory and practice (with D. Morozov). *In* “European Congress of Mathematics, Kraków, 2–7 July, 2012”, Europ. Math. Soc., 31–50.
6. The adaptive topology of a digital image (with O. Symonova). *In* “Proc. 9th Internat. Sympos. Voronoi Diagrams Sci. Engin., 2012”, to appear.
7. Alexander duality for functions: the persistent behavior of land and water and shore (with M. Kerber). *In* “Proc. 28th Ann. Sympos. Comput. Geom., 2012”, 249–258.
8. Diffusion runs low on persistence fast (with C. Chen). *In* “Proc. 13th IEEE Internat. Conf. Comput. Vision, 2011”, 423–430.
9. Detailed reconstruction of 3D plant root shape (with Y. Zheng, S. Gu, C. Tomasi and P. Benfey). *In* “Proc. 13th IEEE Internat. Conf. Comput. Vision, 2011”, 2026–2033.
10. Mean-payoff automaton expressions (with K. Chatterjee, L. Doyen, T. A. Henzinger and P. Rannou). *In* “Proc. 21st Internat. Conf. Concurrency Theory, 2010”, P. Gastin and F. Laroussinie (eds.), Springer-Verlag, Lecture Notes Comput. Sci. **6269**, 269–283.
11. Persistent homology under non-uniform error (with P. Bendich, M. Kerber and A. Patel). *In* “Proc. 35th Internat. Sympos. Found. Comput. Sci., 2010”, P. Hliněný and A. Kučera (eds.), Springer-Verlag, Lecture Notes Comput. Sci. **6281**, 12–23.
12. The robustness of level sets (with P. Bendich, D. Morozov and A. Patel). *In* “Proc. 18th Ann. European Sympos. Alg., 2010”, M. de Berg and U. Meyer (eds.), Springer-Verlag, Lecture Notes Comput. Sci. **6346**, 1–10.
13. The persistent Morse complex segmentation of a 3-manifold (with J. Harer). *In* “3D Physiological Human Workshop, 2009”, N. Magnenat-Thalmann (ed.), Springer-Verlag, Berlin, Lecture Notes Comput. Sci. **5903**, 36–50.
14. Persistent homology for kernels, images, and cokernels (with D. Cohen-Steiner, J. Harer and D. Morozov). *In* “Proc. 20th Ann. ACM-SIAM Sympos. Discrete Alg., 2009”, 1011–1020.
15. Reeb spaces of piecewise linear mappings (with J. Harer and A. Patel). *In* “Proc. 24th Ann. Sympos. Comput. Geom., 2008”, 242–250.
16. Inferring local homology from sampled stratified spaces (with P. Bendich, D. Cohen-Steiner, J. Harer and D. Morozov). *In* “Proc. 48th Ann. Sympos. Found. Comput. Sci., 2007”, 536–546.
17. Alpha-beta witness complexes (with D. Attali, J. Harer and Y. Mileyko). *In* “Proc. 11th Internat. Workshop Alg. Data Structures, 2007”, Springer-Verlag, Lecture Notes Comput. Sci. **4619**, 386–397.
18. Weak witnesses for Delaunay triangulations of submanifolds (with D. Attali and Y. Mileyko). *In* “Proc. ACM Sympos. Solid Phys. Modeling, 2007”, 143–150.
19. Persistence-sensitive simplification of functions on 2-manifolds (with D. Morozov and V. Pascucci). *In* “Proc. 22nd Ann. Sympos. Comput. Geom., 2006”, 127–134.
20. Vines and vineyards by updating persistence in linear time (with D. Cohen-Steiner and D. Morozov). *In* “Proc. 22nd Ann. Sympos. Comput. Geom., 2006”, 119–126.
21. Extraction and simplification of iso-surfaces in tandem (with D. Attali and D. Cohen-Steiner). *In* “Proc. 3rd Eurographics Sympos. Geom. Process., 2005”, 139–148.
22. Coarse and reliable geometric alignment for protein docking (with Y. Wang, P. K. Agarwal, P. Brown and J. Rudolph). *In* “Proc. Pacific Sympos. Biocomputing 2005”, World Scientific, Singapore, 64–75.

23. Surface tiling with differential topology. *In* “Proc. 3rd Eurographics Sympos. Geom. Process., 2005”, 9–11.
24. Local and global comparison of continuous functions (with J. Harer, V. Natarajan and V. Pascucci). *In* “Proc. IEEE Conf. Visualization, 2004”, 275–280.
25. Local search heuristic for rigid protein docking (with V. Choi, P. K. Agarwal and J. Rudolph). *In* “Proc. 4th Intl. Workshop Alg. BioInformatics, 2004”, Springer-Verlag, Lecture Notes Comput. Sci. **3240**, 218-229.
26. Morse-Smale complexes for piecewise linear 3-manifolds (with J. Harer, V. Natarajan and V. Pascucci). *In* “Proc. 19th Ann. Sympos. Comput. Geom., 2003”, 361–370.
27. Relaxed scheduling in dynamic skin triangulation (with A. Üngör). *In* “Japanese Conf. Discrete Comput. Geom.”, J. Akiyama and M. Kano (eds.), Springer-Verlag, Lecture Notes Comput. Sci. **2866**, 135–151, 2003.
28. Smoothing and cleaning up slivers (with X.-Y. Li, G. Miller, A. Stathopoulos, D. Talmor, S.-H. Teng, A. Üngör and N. Walkington). *In* “Proc. 32nd Ann. ACM Sympos. Theory Comput., 2000”, 273–277.
29. Mesh association: formulation and algorithms (with X. Jiao and M. T. Heath). *In* “Proc. 8th Internat. Meshing Roundtable, 1999”, South Lake Tahoe, California, 75–82.
30. Shape reconstruction with Delaunay complex. *In* “Proc. Ann. Sympos. Latin American Theoret. Inform., 1998”, Campinas, Brazil, Springer-Verlag, Lecture Notes Comput. Sci. **1380**, 119–132.
31. Wrapping 3D scanning data (with M. A. Facello, P. Fu, J. Qian and D. V. Nekhayev). *In* “Proc. IS&N/SPIE’s Sympos. Electronic Imaging, 1998”, San Jose, California, 148–158.
32. Geometric modeling in CAVE (with P. Fu and J. Qian). *In* “Proc. ACM Sympos. Virtual Reality Softw. Techn., 1996”, Hong Kong, 35–41 and 193–194.
33. Alpha shapes: definition and software (with N. Akkiraju, M. Facello, P. Fu, E. P. Mücke and C. Varela). *In* “Proc. Internat. Comput. Geom. Software Workshop”, ed. N. Amenta, Rpt. GCG 80, Geometry Center, Minneapolis, Minnesota, 1995.
34. Algebraic decomposition of non-convex polyhedra. *In* “Proc. 36th Ann. IEEE Sympos. Found. Comput. Sci., 1995”, 248–257.
35. Measuring proteins and voids in proteins (with M. Facello, P. Fu and J. Liang). *In* “Proc. 28th Ann. Hawaii Internat. Conf. System Sciences, 1995”, vol. V: Biotechnology Computing, 256–264. (Best paper award.)
36. Modeling with simplicial complexes (topology, geometry, and algorithms). *In* “Proc. 6th Canadian Conf. Comput. Geom. 1994”, 36–44.
37. Spatial triangulations with dihedral angle conditions. *In* “Proc. Internat. Workshop Discrete Algorithms and Complexity 1989”, 83–89, Fukuoka, Japan.
38. Geometric structures in computational geometry. *In* “Proc. 15th Internat. Coll. on Autom. Lang. and Progr. 1988”, 201–213, Springer-Verlag.
39. On the lower envelope of bivariate functions and its applications (with J. Pach, J. T. Schwartz and M. Sharir). *In* “Proc. 28th Ann. IEEE Sympos. Found. Comput. Sci. 1987”, 27–37.
40. Key-problems and key-methods in computational geometry. *In* “Proc. Ann. Sympos. Theoret. Aspects Comput. Sci. 1984”, 1–13, Springer-Verlag.
41. Ham-sandwich theorems applied to intersection problems (with D. P. Dobkin). *In* “Proc. Internat. Workshop on Graphtheoret. Concepts in Comput. Sci. 1984”, 88–99, Teubner.

Patents

1. Methods, apparatus and computer program products that model three-dimensional surface structures (with M. A. Facello, T. Gloth, Z. Terek, and T. Varady). **US 8,004,517**, filed in 2006, issued August 2011.
2. Method, apparatus and computer products that reconstruct surfaces from data points (with G. Y. Fletcher, T. Gloth and P. Fu), **US 7,023,432**, filed September 2001, issued April 2006. **WO 03/027961 A2**, filed July 2002, currently pending.
3. Manufacturing methods and systems for rapid production of hearing-aid shells (with P. Fu and D. Nekhayev), **US 7,050,876**, filed October 2000, issued April 2006, sold to Siemens and Phonak.

4. Method, apparatus and computer program products for automatically generating NURBS models of triangulated surfaces using homeomorphisms (with P. Fu, D. Nekhayev, M. Facello and S. Williams), **US 6,996,505**, filed June 2000, issued February 2006.
5. Methods, apparatus and computer program products for modeling three-dimensional colored objects (with S. Williams and P. Fu), **US 6,853,373**, filed April 2001, issued February 2005.
6. Methods of generating three-dimensional digital models of objects by wrapping point cloud data points (with P. Fu), **US 6,377,865**, filed February 1999, issued April 2002.
7. Molecular classification for property prediction (with J. Liang), **US 6,182,016**, filed August 1997, issued January 2001.
8. Apparatus and method for geometric morphing (with P. Fu), **US 5,850,229**, filed December 1995, issued December 1998.