

W. Randolph Franklin

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Current position:

Professor,
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1 Education

- Passed first two **Canadian Institute of Actuaries** exams, scores: 10/10, 1973.
- B.Sc. (Computer Science), **University of Toronto**, 1973.
- A.M. (Applied Mathematics), **Harvard University**, 1975.
- Ph.D. (Applied Mathematics), **Harvard University**, 1978, *advisor:* Harry R. Lewis, *thesis:* *thesis* Combinatorics of Hidden Surface Algorithms.
- 3 short courses from the **Governmental Affairs Institute at Georgetown University**, 2001–2012.

2 Professional Career

1978–now: Faculty member in the Electrical, Computer, and Systems Engineering Dept, **RPI**.
Current rank: *Professor*.

Sabbatical, 2015–2016: Visits to U Zürich, UC Santa Barbara, IBM Haifa, and Georgia Tech.

2000–2002: Director, Numeric, Symbolic, and Geometric Computation Program, **NSF/CISE/C-CR**. Since renamed to the Graphics, Symbolic, and Geometric Computing Program, and then merged during the CISE reorg. Additional responsibility for some IGERT and ITR panels. Organized, with Ben Mann, MPS/DMS, two joint solicitations with DARPA/DSO (POC: Doug Cochran), called *Computational Algorithms and Representations for Geometric Objects (CARGO)*, NSF 01-111 and NSF 02-155.

Sabbatical, 1992–1993: • **June–July 1993** Visiting scientist at the Institute of Systems Science, **National University of Singapore**. • **April–June 1993** Visit to the Division of Information Technology, **Commonwealth Scientific and Industrial Research Organization**, Canberra, Australia. • **Jan–Mar 1993** Visit to the Dept. de Science Géodésique, **Université de Laval**, Quebec City, Canada. • **Oct–Dec 1992** Visit to the Dipartimento di Informatica e Scienze dell'Informazione, **Università di Genova**, Italy.

Aug 1991, and Aug 1992: Artificial Intelligence Division, **US Army Topographic Engineering Center**.

1986-present: joint appointment in the Computer Science Department, **Rensselaer Polytechnic Institute**.

1985-1986: Visiting Professor in the Computer Science Division, Electrical Engineering and Computer Science Department, **University of California at Berkeley**.

1973-1978: Research Assistant, Lab for Computer Graphics and Analysis, Graduate School of Design, **Harvard**.

Summer 1973: Research Assistant in the Geography Department, **Simon Fraser University** (Canada).

Summers 1968-1972: Research Assistant, Application Group, Computer Centre, **U Ottawa** (Canada).

3 Paper, Talk, and Programming Awards

My collaborators often did most of the work.

- a) Winner (1st place), **GISCUP 2018**, (*reference number [12] below in Section 5 Publications*).
- b) Winner (2nd place), **GISCUP 2016**, [26].
- c) Awarded a Reproducibility Stamp at the International Geometry Summit 2016, [31].
- d) Winner (2nd place), **GISCUP 2015**, [40].
- e) Winner of best paper award, **Geoinfo 2013**, [61].
- f) Winner of the Best Paper Award (2nd place), **AGILE 2012**, [81].
- g) Winner of the best fast forward presentation award, **ACM SIGSPATIAL GIS 2009**, [103].

4 Google Scholar

Citations: 2855, h-index: 28, i10-index: 76 (*as of 2023-01-08*).

5 Publications, Talks, Summaries

This list contains any material of public interest, whether or not officially published.

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|----|---|--------------|
| | <i>Online</i> | <i>ver-</i> |
| | <i>sion:</i> | |
| 1. | W. Randolph Franklin and Salles Viana Gomes de Magalhães. Implementing simulation of simplicity for geometric degeneracies. In <i>4th ACM SIGSPATIAL International Workshop on Spatial Gems (SpatialGems 2022)</i> , 1 Nov 2022. | <i>paper</i> |
| 2. | Marcelo de Matos Menezes, Salles Viana Gomes Magalhães, Matheus Aguilar de Oliveira, W. Randolph Franklin, and Rodrigo Eduardo de Oliveira Bauer Chichorro. Fast parallel evaluation of exact geometric predicates on GPUs. <i>J. Computer Aided Design</i> , (103285), | <i>paper</i> |

September 2022. Special Issue: 28th International Meshing Roundtable: Mesh Modeling for Simulations and Visualization, <https://doi.org/10.1016/j.cad.2022.103285>.

3. W. Randolph Franklin and Salles Viana Gomes de Magalhães. Minimal representations of polygons and polyhedra. In John Krumm, Andreas Züfle, and Cyrus Shahabi, editors, *Spatial Gems*, volume 1, chapter 5. ACM, 2022. *paper*
4. Marcelo de Matos Menezes, Salles Viana Gomes de Magalhães, Matheus Aguilar, W. Randolph Franklin, and Bruno Coelho. Employing GPUs to accelerate exact geometric predicates for 3D geospatial processing. In John Krumm, Andreas Züfle, and Cyrus Shahabi, editors, *Spatial Gems*, volume 1, chapter 11. ACM, 2022. *paper*
5. W. Randolph Franklin, Salles Viana Gomes de Magalhães, and Eric N Landis. Fast 3-D Euclidean connected components. In John Krumm, editor, *3rd ACM SIGSPATIAL International Workshop on Spatial Gems (SpatialGems 2021)*. ACM, 2 Nov 2021. *paper*
6. Marcelo de Matos Menezes, Salles Viana Gomes de Magalhães, Matheus Aguilar, W. Randolph Franklin, and Bruno Coelho. Employing GPUs to accelerate exact geometric predicates for 3D geospatial processing. In John Krumm, editor, *2nd ACM SIGSPATIAL International Workshop on Spatial Gems (SpatialGems 2020)*. ACM, Nov 2020. Best paper award. *paper*
7. W. Randolph Franklin, Salles Viana Gomes de Magalhães, and Wenli Li. Siting thousands of radio transmitter towers on terrains with billions of points, 2020. arXiv 2006.16783. *paper*
8. W. Randolph Franklin and Salles Viana Gomes de Magalhães. Minimal representations of polygons and polyhedra. In John Krumm, editor, *1st ACM SIGSPATIAL International Workshop on Spatial Gems (SpatialGems 2019)*. ACM, Nov 2019. *paper*
9. Marcelo de Matos Menezes, Salles Viana Gomes Magalhães, W. Randolph Franklin, Matheus Aguilar de Oliveira, and Rodrigo E. O. Bauer Chichorro. Accelerating the exact evaluation of geometric predicates with GPUs. In Suzanne Shontz, Joaquim Peiró, and Ryan Viertel, editors, *28th International Meshing Roundtable*, Buffalo, NY, USA, 16 Oct 2019. 10.5281/zenodo.3653101. *paper, talk*
10. Salles V. G. de Magalhães, W. Randolph Franklin, and Marcus V. A. Andrade. An efficient and exact parallel algorithm for intersecting large 3-d triangular meshes using arithmetic filters. *J. Computer Aided Design*, 120, March 2020. online 2019-12-19, <https://doi.org/10.1016/j.cad.2019.102801>. *paper*
11. W. Randolph Franklin and Salles V. G. de Magalhães. Computing intersection areas of overlaid 2d meshes. In *IGS2019 International Geometry Summit Posters' proceedings*, Vancouver, Canada, 17-21 June 2019. Solid Modeling Association. *paper, poster*
12. Salles Viana Gomes de Magalhães, W. Randolph Franklin, and Ricardo dos Santos Ferreira. Fast analysis of upstream features on spatial networks (GIS Cup). In *Proceedings of the 26th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems*, SIGSPATIAL '18, pages 622-625, New York, NY, USA, 2018. ACM. Winner (1st place), <https://doi.org/10.1145/3274895.3276474>. *paper, talk*
13. W. Randolph Franklin, Salles V. G. de Magalhães, and Marcus V. A. Andrade. Data structures for parallel spatial algorithms on large datasets (vision paper). In *Proceedings of BigSpatial'18: 7th ACM SIGSPATIAL Workshop on Analytics for Big Geospatial Data*, Seattle, USA, 6 Nov 2018. *paper, talk*

14. W. Randolph Franklin, Salles V. G. de Magalhães, and Marcus V. A. Andrade. Exact fast parallel intersection of large 3-D triangular meshes (extended abstract). In *28th Annual Fall Workshop on Computational Geometry*, Queens College, CUNY, New York City, 26-27 Oct 2018. paper
15. W. Randolph Franklin, Salles V. G. de Magalhães, and Marcus V. A. Andrade. Exact fast parallel intersection of large 3-D triangular meshes. In *27th International Meshing Roundtable*, Albuquerque, New Mexico, 2 Oct 2018. paper, talk
16. W. Randolph Franklin and Carlos Varela. Intelligent cognitive assistant for emergency landings using gpu geometric computing and online statistical reasoning. unpublished, 2018. paper
17. W. Randolph Franklin. Applications of geometry. In Kenneth H Rosen, editor, *Handbook of Discrete and Combinatorial Mathematics*, Discrete Mathematics and Its Applications, chapter 13.8, pages 998-1022. CRC Press, 2nd edition, 1 Dec 2017. paper
18. W. Randolph Franklin and Salles V. G. de Magalhães. Parallel intersection detection in massive sets of cubes. In *27th Fall Workshop on Computational Geometry*, Stony Brook University, New York, USA, 3-4 Nov 2017. (talk). abstract, talk
19. W. Randolph Franklin and Salles V. G. de Magalhães. Parallel intersection detection in massive sets of cubes. In *Proceedings of BigSpatial'17: 6th ACM SIGSPATIAL Workshop on Analytics for Big Geospatial Data*, Los Angeles Area, CA, USA, 7-10 Nov 2017. <https://doi.org/10.1145/3150919.3150921>. paper, talk
20. Salles V. G. de Magalhães, W. Randolph Franklin, and Marcus V. A. Andrade. Fast exact parallel 3D mesh intersection algorithm using only orientation predicates. In *25th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems (ACM SIGSPATIAL 2017)*, Los Angeles Area, CA, USA, 7-10 Nov 2017. paper, talk
21. W. Randolph Franklin, Salles V. G. de Magalhães, and Marcus V. A. Andrade. 3D-EPUG-Overlay: Intersecting very large 3D triangulations in parallel. In *2017 SIAM conference on industrial and applied geometry*, Pittsburgh PA USA, 10-12 July 2017. (talk). abstract, talk
22. W. Randolph Franklin, Salles V. G. de Magalhães, and Marcus V. A. Andrade. An exact and efficient 3D mesh intersection algorithm using only orientation predicates. In *S3PM-2017: International Convention on Shape, Solid, Structure, & Physical Modeling, Shape Modeling International (SMI-2017) Symposium*, Berkeley, California, USA, 19-23 June 2017. (poster). abstract, poster
23. W. Randolph Franklin. Efficient parallel GIS and CAD operations on very large data sets, 31 Oct 2016. Invited keynote talk at ACM SIGSPATIAL GIS PhD Workshop. talk
24. Salles V. G. de Magalhães, Marcus V. A. Andrade, W. Randolph Franklin, Wenli Li, and Maurício Gouvêa Gruppi. Exact intersection of 3D geometric models. In *GeoInfo 2016, XVII Brazilian Symposium on GeoInformatics*, Campos do Jordão, SP, Brazil, November 2016. Instituto Nacional de Pesquisas Espaciais (Brasil). paper, talk
25. Wenli Li, W. Randolph Franklin, and Salles V. G. de Magalhães. Computing approximate horizons on a GPU. In *26th Fall Workshop on Computational Geometry*, CUNY Graduate Center, New York, USA, 27-28 Oct 2016. (extended abstract). paper, talk

26. Salles Viana Gomes de Magalhães, W. Randolph Franklin, Wenli Li, and Marcus Vinicius Alvim Andrade. An efficient map-reduce algorithm for spatio-temporal analysis using spark (GIS Cup). In *5th GIS-focused algorithm competition, GIS Cup 2016, co-located with ACM SIGSPATIAL GIS*, 2016. Winner (2nd place). paper, talk
27. Wenli Li and W. Randolph Franklin. GPU-accelerated multiple observer siting. *Photogrammetric Engineering & Remote Sensing*, 83(6):439–446, June 2017. <https://doi.org/10.14358/PERS.83.6.439>. paper
28. Wenli Li, W. Randolph Franklin, Salles V. G. de Magalhães, Marcus V. A. Andrade, and David L. Hedin. 3D segmented ODETLAP compression, 2016. paper
29. David Hedin and W. Randolph Franklin. Nearptd: A parallel implementation of exact nearest neighbor search using a uniform grid. In *Canadian Conference on Computational Geometry*, Vancouver Canada, August 2016. paper, talk
30. W. Randolph Franklin. Minimum spatial representations, 2016. (unpublished). paper
31. Salles V. G. de Magalhães, Marcus V. A. Andrade, W. Randolph Franklin, and Wenli Li. PinMesh - Fast and exact 3D point location queries using a uniform grid. *Computer & Graphics Journal, special issue on Shape Modeling International 2016*, 58:1–11, August 2016. (online 17 May). Awarded a reproducibility stamp, <http://www.reproducibilitystamp.com/>, <https://doi.org/10.1016/j.cag.2016.05.017>. paper, talk
32. Chaulio R. Ferreira, Marcus V. A. Andrade, Salles V. G. de Magalhães, and W. Randolph Franklin. An efficient external memory algorithm for terrain viewshed computation. *ACM Trans. on Spatial Algorithms and Systems*, 2(2), 2016. <https://doi.org/10.1145/2903206>. paper
33. W. Randolph Franklin and Salles Viana Gomes de Magalhães. Local topology and parallel overlaying large planar graphs, 15 Feb 2016. Talk at Georgia Tech, School of Interactive Computing. Also given at IBM Haifa, Microsoft Haifa, Ben Gurion U, and Tel Aviv U in Dec 2015. talk
34. Max J Egenhofer, Keith C Clarke, Song Gao, Teriitutea Quesnot, W. Randolph Franklin, May Yuan, and David Coleman. Contributions of GIScience over the past twenty years. In Harlan Onsrud and Werner Kuhn, editors, *Advancing Geographic Information Science: The Past and Next Twenty Years*, chapter 1, pages 9–34. GSDI association press, 2016. paper
35. Mehrad Kamalzare, Thomas F. Zimmie, Barbara Cutler, and W. Randolph Franklin. A new visualization method to evaluate sediment transport and erosion. *Geotechnical Testing Journal*, 39(3), May 2016. <https://doi.org/10.1520/GTJ20140226>. paper
36. Mauricio G. Gruppi, Salles V. G. de Magalhães, Marcus V. A. Andrade, W. Randolph Franklin, and Wenli Li. An efficient and topologically correct map generalization heuristic. In *Proceedings of the 17th International Conference on Enterprise Information Systems (ICEIS)*, pages 516–525, paper 236, 2015. <https://doi.org/10.5220/0005398105160525>. paper
37. W. Randolph Franklin and Salles Viana Gomes de Magalhães. Global properties from local topology, 10 Nov 2015. Talk at UC Santa Barbara, Center for Spatial Studies. talk
38. Mehrad Kamalzare, Thomas F. Zimmie, Zhongxian Chen, Christopher Stuetzle, Barbara Cutler, and W Randolph Franklin. Computer erosion modeling considering soil hy- paper

- draulic conductivity. *Journal of Geotechnical and Transportation Engineering*, 1(1), 22 June 2015.
39. Maurício Gouvêa Gruppi, Salles V. G. de Magalhães, Marcus V. A. Andrade, W. Randolph Franklin, and Wenli Li. Using rational numbers and parallel computing to efficiently avoid round-off errors on map simplification. In *Geoinfo 2015, XVI Brazilian Symposium on GeoInformatics*, Campos do Jordão, SP, Brazil, 29 Nov – 2 Dec 2015. *paper, talk*
 40. Salles V. G. de Magalhães, Marcus V. A. Andrade, W. Randolph Franklin, and Wenli Li. Fast path planning under polygonal obstacle constraints. In *4th GIS-focused algorithm competition, GISUP 2015, co-located with ACM SIGSPATIAL GIS*, Bellevue WA USA, 4 Nov 2015. Winner (2nd place). *paper*
 41. Salles V. G. de Magalhães, Marcus V. A. Andrade, W. Randolph Franklin, and Wenli Li. Fast exact parallel map overlay using a two-level uniform grid. In *4th ACM SIGSPATIAL International Workshop on Analytics for Big Geospatial Data (BigSpatial)*, Bellevue WA USA, 3 Nov 2015. <https://doi.org/10.1145/2835185.2835188>. *paper*
 42. Wenli Li, W. Randolph Franklin, and Salles V. G. de Magalhães. Segmented ODETLAP compression. In *25th Fall Workshop on Computational Geometry*, U. Buffalo, New York, USA, 23-24 Oct 2015. (extended abstract). *paper*
 43. Salles V. G. de Magalhães, W. Randolph Franklin, Marcus V. A. Andrade, and Wenli Li. An efficient algorithm for computing the exact overlay of triangulations. In *25th Fall Workshop on Computational Geometry*, U. Buffalo, New York, USA, 23-24 Oct 2015. (extended abstract). *paper*
 44. W. Randolph Franklin, Marcus Andrade, Wenli Li, and Salles de Magalhães. Changing problems, databases, and tools in spatial search, 24 Aug 2015. Talk at U. Zürich, Dept of Geography. *talk*
 45. W. Randolph Franklin. Algorithms, libraries, and development environments to process huge geoinformatic databases on modern hardware. Talk at CCNY, 15 April 2015. *talk*
 46. Marcus Andrade, Salles de Magalhães, W. Randolph Franklin, and Wenli Li. Research topics in GIS. Talk at CCNY, 15 April 2015. *talk*
 47. Wenli Li, W. Randolph Franklin, Marcus Andrade, and Salles de Magalhães. Research summary: Siting and ODETLAP. Talk at CCNY, 15 April 2015. *talk*
 48. Thiago L. Gomes, Salles V. G. de Magalhães, Marcus V. A. Andrade, W. Randolph Franklin, and Guilherme C. Pena. Efficiently computing the drainage network on massive terrains with an external memory flooding process. *Geoinformatica*, April 2015. <http://link.springer.com/article/10.1007/s10707-015-0225-y>, <https://doi.org/10.1007/s10707-015-0225-y>. *paper*
 49. W. Randolph Franklin and Marcus Andrade. The changing problems, databases, and tools in spatial search. In *University of California at Santa Barbara, Spatial Search Specialist Workshop*, 8–9 Dec 2014. *paper, talk*
 50. Salles V. G. de Magalhães, W. Randolph Franklin, Wenli Li, and Marcus V. A. Andrade. Fast map generalization heuristic with a uniform grid. In *22nd ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems (ACM SIGSPATIAL 2014)*, Dallas, Texas, USA, 4–7 Nov 2014. *paper, talk, poster*

51. Wenli Li, W. Randolph Franklin, Daniel N. Benedetti, and Salles V. G. de Magalhães. *paper, poster*
Parallel multiple observer siting on terrain. In *22nd ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems (ACM SIGSPATIAL 2014)*, Dallas, Texas, USA, 4–7 Nov 2014.
52. Guilherme Pena, Salles de Magalhães, Marcus Andrade, Randolph Franklin, Chaulio Ferreira, Wenli Li, and Daniel Benedetti. *paper, talk*
An efficient GPU multiple-observer siting method based on sparse-matrix multiplication. In *3rd ACM SIGSPATIAL International Workshop on Analytics for Big Geospatial Data (BigSpatial) 2014*, Dallas TX USA, 4 Nov 2014.
53. Salles V. G. de Magalhães, W. Randolph Franklin, Marcus V. A. Andrade, and Wenli Li. *paper, talk*
An efficient map generalization heuristic based on the Visvalingam–Whyatt algorithm. In *24th Fall Workshop on Computational Geometry*, U. Connecticut, Storrs CT, USA, 31 Oct – 1 Nov 2014. (extended abstract).
54. Wenli Li, W. Randolph Franklin, Salles V. G. de Magalhães, and Marcus V. A. Andrade. *paper, talk*
Restricted bathymetric tracklines interpolation. In *24th Fall Workshop on Computational Geometry*, U. Connecticut, Storrs CT, USA, 31 Oct – 1 Nov 2014. (extended abstract).
55. Salles V. G. de Magalhães and W. Randolph Franklin. *paper, talk*
Exactly computing map overlays using rational numbers. In *Autocarto 2014*, Pittsburgh PA, 5–7 Oct 2014. Cartography and Geographic Information Society. (abstract only).
56. Chaulio R. Ferreira, Marcus V. A. Andrade, Salles V. G. de Magalhães, W. R. Franklin, and Guilherme C. Pena. *paper*
A parallel algorithm for viewshed computation on grid terrains. *Journal of information and data management*, 5(1), 2014. invited.
57. Salles V. G. de Magalhães, Marcus V. A. Andrade, W. Randolph Franklin, and Guilherme C. Pena. *paper*
A linear time algorithm to compute the drainage network on grid terrains. *J. Hydroinformatics*, 16(6):1227–1234, 2014. Update of the winner of the Best Paper Award (2nd place) at AGILE 2012, <https://doi.org/10.2166/hydro.2013.068>.
58. Guilherme C. Pena, Marcus V.A. Andrade, Salles V.G. de Magalhães, W. R. Franklin, and Chaulio R. Ferreira. *paper, talk*
An improved parallel algorithm using GPU for siting observers on terrain. In *16th International Conference on Enterprise Information Systems (ICEIS 2014)*, pages 367–375, Lisbon, 27–30 April 2014. <https://doi.org/10.5220/0004884303670375>.
59. W. Randolph Franklin. *talk*
Algorithms, libraries, and development environments to process huge geoinformatic databases on modern hardware. Geoinfo 2013, XIV Brazilian Symposium on GeoInformatics, 26 Nov 2013. Keynote talk, <http://www.geoinfo.info/geoinfo2013/index.php>.
60. Randolph Franklin. *paper*
Adaptive grids then and now. In Barry Wellar, editor, *AutoCarto Six Retrospective*, pages 119–124. Information Research Board Inc., 2013.
61. Chaulio R. Ferreira, Marcus V. A. Andrade, Salles V. G. de Magalhães, W. R. Franklin, and Guilherme C. Pena. *paper*
A parallel sweep line algorithm for visibility computation. In *Geoinfo 2013, XIV Brazilian Symposium on GeoInformatics*, Campos do Jordão, SP, Brazil, 24–27 Nov 2013. Winner of best paper award, <http://www.geoinfo.info/geoinfo2013/index.php>.
62. Wenli Li, W. Randolph Franklin, and Daniel Benedetti. *paper, talk*
Parallel multiple observer siting

- on terrain. In *23rd Fall Workshop on Computational Geometry*, City College, New York City, USA, 25–26 Oct 2013. (extended abstract).
63. Daniel Benedetti, W. Randolph Franklin, and Wenli Li. CUDA-accelerated ODETLAP: A parallel lossy compression implementation. In *23rd Fall Workshop on Computational Geometry*, City College, New York City, USA, 25–26 Oct 2013. (extended abstract). paper, talk
 64. W. Randolph Franklin. Parallel volume computation of massive polyhedron union. In *23rd Fall Workshop on Computational Geometry*, City College, New York City, USA, 25–26 Oct 2013. (extended abstract). paper, talk
 65. W. Randolph Franklin. Research summary slides, September 2013. paper
 66. W. Randolph Franklin. Geometric operations on millions of objects. (talk), 24 July 2013. paper
 67. Mehrad Kamjaalzare, Thomas F. Zimmie, Tianning Steven Han, Matt McMullan, Barbara Cutler, and W. Randolph Franklin. Computer simulation of levee’s erosion and overtopping. In *The 18th international conference on soil mechanics and geotechnical engineering*, pages 743–746, Paris, France, 2–6 Sept 2013. <http://www.issmge2013.org/>. paper
 68. W. Randolph Franklin, You Li, Tsz-Yam Lau, and Peter Fox. CUDA-accelerated HD-ODETLAP: Lossy high dimensional gridded data compression. In Xuan Shi, Volodymyr Kindratenko, and Chaowei Yang, editors, *Modern Accelerator Technologies for Geographic Information Science*. Springer, 2013. paper
 69. Tsz-Yam Lau and W. Randolph Franklin. River network completion without height samples using geometry-based induced terrain. *Cartography and Geographic Information Science*, 40(2):316–325, 29 Apr 2013. <https://doi.org/10.1080/15230406.2013.780785>. paper
 70. Mehrad Kamalzare, Tianning Steven Han, Matt McMullan, Chris Stuetzle, Thomas F. Zimmie, Barbara Cutler, and W. Randolph Franklin. Computer simulation of levee erosion and overtopping. In Christopher Meehan, Daniel Pradel, Miguel A. Pando, and Joseph F. Labuz, editors, *Proceeding: Geo-Congress 2013: Stability and Performance of Slopes and Embankments*, pages 1851–1860, San Diego, California, USA, 3–7 Mar 2013. American Society of Civil Engineers. <https://doi.org/10.1061/9780784412787.186>. paper
 71. Thiago L. Gomes, Salles V. G. de Magalhães, Marcus V. A. Andrade, W. Randolph Franklin, and Guilherme C. Pena. Computing the drainage network on huge grid terrains. In *1st ACM SIGSPATIAL International Workshop on Analytics for Big Geospatial Data (BigSpatial-2012)*, Redondo Beach, CA, 6 Nov 2012. paper, talk
 72. Tsz-Yam Lau and W. Randolph Franklin. Automated artifact-free seafloor surface reconstruction with two-step ODETLAP (Ph.D. showcase). In *20th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems (ACM SIGSPATIAL GIS 2012)*, Redondo Beach, CA, 6–9 Nov 2012. paper, poster
 73. Chaulio R. Ferreira, Salles V. G. de Magalhães, Marcus V. A. Andrade, W. Randolph Franklin, and André M. Pompermayer. More efficient terrain viewshed computation on massive datasets using external memory. In *20th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems (ACM SIGSPATIAL GIS 2012)*, Redondo Beach, CA, 6–9 Nov 2012. paper, poster
 74. W. Randolph Franklin, You Li, Tsz-Yam Lau, and Peter Fox. CUDA-accelerated HD-ODETLAP: Lossy high dimensional gridded data compression. In *2012 International* paper, talk

Workshop on Modern Accelerator Technologies for GIScience (MAT4GIScience 2012), Columbus OH, 18 Sep 2012.

75. Christopher Stuetzle and W. Randolph Franklin. Representation of terrain data by drilling process. In *2012 AutoCarto International Symposium on Automated Cartography*, Columbus OH, 16-18 Sep 2012. abstract. *abstract, talk*
76. Tsz-Yam Lau and W. Randolph Franklin. Improving river network completion under absence of height samples using geometry-based induced terrain approach. In *2012 AutoCarto International Symposium on Automated Cartography*, Columbus OH, 16-18 Sep 2012. *paper, talk*
77. Christopher Stuetzle and W. Randolph Franklin. Representing terrain with mathematical operators. In *15th International Symposium on Spatial Data Handling*, Bonn, Germany, 22-24 Aug 2012. *paper, talk*
78. Tsz-Yam Lau and W. Randolph Franklin. Better completion of fragmentary river networks with the induced terrain approach by using known non-river locations. In *15th International Symposium on Spatial Data Handling*, Bonn, Germany, 22-24 Aug 2012. *paper, talk*
79. Mehrad Kamalzare, Thomas F. Zimmie, Christopher Stuetzle, Barbara Cutler, and W. Randolph Franklin. Computer simulation of levee's erosion and overtopping. In *International Symposium on Environmental Geotechnology, Energy and Global Sustainable Development*, Los Angeles, California, USA, June 2012. *paper*
80. Mehrad Kamalzare, Christopher Stuetzle, Zhongxian Chen, Thomas F. Zimmie, Barbara Cutler, and W. Randolph Franklin. Validation of erosion modeling: physical and numerical. In *Geo-Congress 2012: Annual congress of the geo-institute of ASCE*, Oakland, California, USA, 25-29 Mar 2012. <http://www.geocongress2012.org/>. *paper*
81. Salles V. G. de Magalhães, Marcus V. A. Andrade, W. Randolph Franklin, and Guilherme C. Pena. A new method for computing the drainage network based on raising the level of an ocean surrounding the terrain. In Jérôme Gensel, Didier Josselin, and Danny Vandenbroucke, editors, *Bridging the Geographic Information Sciences: International AGILE'2012 Conference*, pages 391-407. Springer, Avignon (France), 24-27 April 2012. Winner of the Best Paper Award (2nd place). *paper, talk*
82. Tsz-Yam Lau, You Li, and W. Randolph Franklin. Joining fragmentary river segments with elevations and water flow directions using induced terrain (extended abstract). In *21st Fall Workshop on Computational Geometry*, City College, New York City, USA, 4-5 Nov 2011. *paper*
83. Christopher Stuetzle, Barbara Cutler, Zhongxian Chen, W. Randolph Franklin, Mehrad Kamalzare, and Thomas Zimmie. Ph.d. showcase: Measuring terrain distances through extracted channel networks. In *19th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems (ACM SIGSPATIAL GIS 2011)*, Chicago USA, 1-4 Nov 2011. *paper, poster*
84. Mehrad Kamalzare, Zhongxian Chen, Christopher Stuetzle, Barbara Cutler, W. Randolph Franklin, and Thomas F. Zimmie. Computer simulation of overtopping of levees. In *2011 Pam-Am CGS Geotechnical Conference: 14th Pan-American Conference on Soil Mechanics and Geotechnical Engineering*, Toronto, 2-6 Oct 2011. *paper*

85. Salles V. G. de Magalhães, Marcus V. A. Andrade, and W. Randolph Franklin. Multiple observer siting in huge terrains stored in external memory. *International Journal of Computer Information Systems and Industrial Management (IJCISIM)*, 3, 2011. paper
86. Tsz-Yam Lau and W. Randolph Franklin. Completing fragmentary river networks via induced terrain. *Cartography and Geographic Information Science*, 38(2):162–174, April 2011. <https://doi.org/10.1559/15230406382161a>. paper
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214. W. Randolph Franklin. Padded lists—set operations in $O(\log\log N)$ time. *Information Processing Letters*, 9(4):161-166, November 1979. paper
215. W. Randolph Franklin. Prism — a prism plotting program. In Allan H. Schmidt, editor, *Mapping Software and Cartographic Data Bases*, Harvard Library of Computer Mapping, 1979 collection, pages 75-79. 1979.
216. Wm Randolph Franklin. *Combinatorics of hidden surface algorithms*. Technical Report, thesis Center for Research in Computing Technology, Harvard Univ., Cambridge, MA, June 1978.
217. Wm Randolph Franklin and Harry R. Lewis. 3-D graphic display of discrete spatial data by prism maps. In *Proc. SIGGRAPH'78*, volume 12(3), pages 70-75, August 1978. paper
218. William G. Nisen and W. Randolph Franklin. The maturation of computer graphics. *ICP Interface Manufacturing and Engineering*, 3(4):5-11, 1978. paper

6 Synergistic Activities and Service

1. My software is freely available for nonprofit research and education; see <https://wrfranklin.org/Software>. I still receive, and respond to, questions about PNPOLY, which I wrote around 1970.
2. Helped develop courses from freshman to graduate, in both the traditional lecture, and the newer studio, formats. A significant contributor to the National Electrical Engineering Department Heads Association (NEEDHA) Innovative Program Award to RPI's ECSE Dept.
3. Five ABET/CAC site visits and two NY State Science & Tech Foundation site visits.
4. Member of the Union College (Schenectady) Computer Engineering Program Advisory Committee since 2000.
5. External visitor to evaluate programs at Houston (2014) and U Albany (2016).
6. An incorporator of, and board member of, the Institute for Infrastructure Asset Management, Sept 1998-present. This is a nonprofit NYS corporation to provide research, development, consulting, and educational services to maximize the efficient utilization of infrastructure investments.
7. Have applied specialized expertise in short-term work for US Army Topographic Engineering Center, NY State Dept of Health & Dept of Motor Vehicles, Chemical Bank, Bearing Sciences, Lockheed-Martin, et al.
8. Two Army SBIRs, *A07-126 Optimal Intervisibility Site Selection* and *A07-123 Novel Representations of Elevation Data* appear to be based on my work (one cites me four times).
9. External reader for doctoral theses at U. Tasmania, National University of Singapore, SUNY Buffalo, U. Waterloo.
10. External visiting member of doctoral thesis at Eindhoven.
11. Proposal reviewing for NSF, ARO, Dutch NWO, UK NERC.

12. Paper reviewing and/or program committeeing for IJGIS, Geoinformatica, Geographical Analysis, SIGGRAPH, SDH, IEEE, PE&RS, GIScience, ACM SIGSPATIAL GIS, etc.
13. Associate editor for ACM T. Spatial Algorithms and Systems.
14. *Inside RPI*: several terms on each of Faculty Council, Faculty Senate, Planning and Resources Committee, Provost's Computer Committee, President's and Provost's Panel on Strategic Initiatives, Registrar's BANNER Implementation Committee, Y2K Planning Committee, Residence Life Opening Doors program.

7 Former Grad Students

Graduated: 70 masters students and the following 18 doctoral students. Their positions listed below are current as of Jan 2019.

1. Varol Akman, *Shortest paths avoiding polyhedral obstacles in 3-dimensional Euclidean space*, 1985. Founding Chair, Philosophy Dept, Bilkent (Turkey).
2. William S. Yerazunis, *DIS - An Architecture for fast Lisp execution*, 1987. Senior Principal Research Scientist, Data Analytics / Hardware Lead at Mitsubishi Electric Research Laboratories, Cambridge MA.
3. Peter Yick-Fai Wu, *Polygon overlay in Prolog* 1987. Interim Department Head, Computer and Information Systems, Robert Morris U.
4. Ernesto Guerrieri, *A Methodology for software transportability*, 1989.
5. Mohan Kankanhalli, *Techniques for parallel geometric computations*, 1990. Dean, School of Computing Provost's Chair Professor of Computer Science, and former vice-Provost, National University of Singapore.
6. Chandrasekhar Narayanaswami, *Parallel processing for geometric applications*, 1991. Principal Research Staff Member, Member IBM Academy of Technology, Member IBM Industry Academy Thomas J. Watson Research Center, IBM.
7. Clark K. Ray, *Representing visibility for siting problems*, 1994.
8. Victor Skowronski, *Synthesizing tolerances for optimal design using the Taguchi quality loss function*, 1996.
9. Michael Gousie, *Contours to digital elevation models: grid-based surface reconstruction methods*, 1998. Professor of Computer Science, Wheaton College, Mass.
10. Helio Pedrini, *An Adaptive method for terrain surface approximation based on triangular meshes*, 2000. Chair of the Department of Information Systems, University of Campinas (Brasil).
11. Linda Lim, *Haptic and multi-modal interaction for teaching and designing basic controls*, 2004.
12. Metin Inanc, *Compressing terrain elevation datasets*, 2008.
13. Dan Tracy, *Path planning and slope representation on compressed terrain*, 2009.
14. You Li, *CUDA-accelerated HD-ODETLAP: A high dimensional geospatial data compression framework*, 2011.
15. Chris Stuetzle, *Representation and generation of terrain using mathematical modeling*, 2012. Associate Professor, Computer Science, Merrimack College, Mass.
16. Tsz-Yam (Eddie) Lau, *Two-step ODETLAP and induced terrain framework for improved geographical data reconstruction*, 2012.

17. Wenli Li, *GPU-accelerated terrain processing*, 2016.
18. Salles Viana Gomes de Magalhães, *Exact and parallel intersection of 3D triangular meshes*, 2017. Professor Adjunto, Departamento de Informática, Universidade Federal de Viçosa (Brasil).

8 Teaching or Course Development

The home pages for my recent courses are here: <https://wrfranklin.org/nikola/pages/teaching/>.

1. Courses created: Quantum Computer Programming (*senior and grad*), Engineering Parallel Computing (*senior and grad*), Computational Geometry (*grad*), Advanced Computer Graphics (*grad*).
2. Courses taught, often with considerable course development: Computing Fundamentals for Engineers (*freshmen*), Computer Organization and Logic Design (*sophomore*), Computer Components and Operations (*sophomore studio*), Introduction to Engineering Design (*sophomore*), Engineering Probability (*junior*), Computer Graphics (*senior and grad*), Data Structures (*senior*), Programming Languages (*senior/grad*), Interactive Computer Aided Design (*senior*), Software Engineering (*grad*).

9 Hardware Used

DEC (PDP 1, 8, 10, 11, Vax 11/780), IBM (1620, 7094, 360, 370, 5100), Prime, Lisp Machine, Sun Sparc, Motorola (6811, 68000, 68010, 68020), Sequent Balance, Thinking Machines CM-2, Intel (8051, 8086, Pentium, Xeon), AMD Opteron, NVIDIA. *Wordlengths (bits)*: 8, 12, 16, 32, 36.

10 Professional

Memberships ACM, IEEE, SIAM, ACSM, Computer Graphics Pioneers.

Editorship Associate editor, ACM Transactions on Spatial Algorithms and Systems

Philanthropy 2022: private sponsor of ACM SIGSPATIAL conference: sponsored 10 students, principally GIS Cup winners, to travel to conference.

11 Major Research Grants

1. *Rapid: Flood and Erosion Reconnaissance: Hurricanes Irene and Lee, Upstate New York and Western New England*, Tom Zimmie, Barb Cutler and me, NSF CMMI-1158899, 2011-2012, \$30,123.
2. *CGV: Small: Towards a Mathematics of Terrain*, NSF/CISE IIS-1117277, (sole PI), 2011-2014, \$500,000.

3. *CDI-Type I: Fundamental Terrain Representations and Operations*, Barb Cutler, Tom Zimmie and me, NSF/ENG/CDI, 2008–2012, \$670,000.
4. *Fall Workshop on Computational Geometry 2008*, Barb Cutler and me, NSF/CISE/NSG, 2008, \$12,335.
5. *Geospatial Representation and Analysis (Geo*): Geologically Correct Terrain Data Structures & Radar Siting*, DARPA/DSO, Phase I and Phase II, sole PI, \$1.3M, 2005–2008.
6. *CMG Research: Adaptation of Microlocal and Time-reversal Techniques to Tomographic Analysis of Locally Recorded Earthquake Seismograms*, Steve Roecker, Margaret Cheney, me, and Joyce McLaughlin, NSF, 2003–2006, \$582,965.
7. *Simulation and Analysis of Large Scale Complex Systems*, Malik Magdon-Ismael, me, Selmer Bringsjord, Mark Goldberg, Boleslaw Szymanski, NSF, 2003, \$155,969.
8. *CG Techniques for Terrain Representation*, NSF/CISE/C-CR/GSG, 2003–2006, \$192,000 including REU supplements.
9. *RPI Research Revitalization award*, 2002, \$50,000.
10. *Parallel Computational Geometry Algorithms and Implementations*, NSF/CCF, 1992, \$99,993.
11. *Logic Programming for Computational Geometry and Computer Aided Design Algorithms*, NSF Presidential Young Investigator Award, 1984–1989, \$500,000 including cost-sharing from IBM, Schlumberger-Doll and Sun Microsystems.
12. *Efficient Computer Aided Design Algorithms*, 1981–1983, \$69,000.
13. *Fundamentals of Hidden Surface Algorithms*, NSF/ENG, 1979–1981, \$32,000.