

References and Bibliography

- Abdul-Rahman, A (1992) Triangular irregular network in digital terrain relief modelling. M. Sc. Thesis, ITC, Enschede, The Netherlands, 80 p.
- Abdul-Rahman, A (2000) The design and implementation of a two and three-dimensional triangular irregular network based GIS. PhD Thesis, University of Glasgow, U.K., 204 pp.
- Alagic, S (1989) Object-oriented database programming. Springer Verlag, New York, 320 pp.
- Alexandroff, P (1961) Elementary concepts of topology. Dover Publications, Inc., New York.
- Alia, A., Williams, H (1994) Approaches to the representation of qualitative spatial relationships for geographic databases. In: Molenaar, M., and De Hoop, S., (Eds.) Advanced geographic data modelling. Netherlands Geodetic commission, pp. 204-216
- Anton, H (1987) Elementary linear algebra, Fifth edition, John Wiley & Sons.
- Arc/Info (1991) Surface modelling with TIN. Arc/Info user's guide. ESRI, U.S.A.
- Argiro, V., Van Zandt, W (1992) Voxels: data in 3D, Byte, Vol. 17, May, pp. 177-182
- Armstrong, M.A (1983) Basic topology, Springer, New York.
- Avis, D., Bhattacharya, K.B (1983) Algorithms for computing d-dimensional Voronoi diagrams and their duals. Advances in Computing Research, 1, pp. 159-180
- Ayugi, S.W.O (1992) The multi-valued vector map. M.Sc. Thesis, ITC, Enschede, The Netherlands
- Bak, P.R.G, Mill, A.J.B (1989) Three dimensional representation in a geoscientific resource management system for minerals industry. In: Raper, J.(Ed.) Three dimensional applications in geographical information systems. Taylor & Francis, London, pp. 155-182
- Barbalata, J.C., Lebel, R (1992) Digital elevation model for photogrammetric measurements of soil erosion. International Archives of Photogrammetry and Remote Sensing. Vol. XXIX, Part B4, Commission IV, Washington, D.C., U.S.A., pp. 831-835
- Batten, L.G (1989) National capital urban planning project: development of a 3-D GIS. Proc. of GIS/LIS '89. ACSM/ASPRS. Falls Church, pp. 781-786.
- Beatty, J.C., Booth, K.S (1982) Tutorial: computer graphics. Second Edition, IEEE Computer Society Press, Silver Spring, MD
- Bernal, J(1988) On constructing Delaunay triangulation for a set of constrained line segments. Technical Note 1252, National Institute of Standards and Technology, United States of Commerce
- Blum, H (1967) A transformation for extracting new descriptors of shape. Proceedings of Symposium on Models for Perception of Speech and Visual Form. MIT Press, Cambridge, Mass., pp. 362-380

- Bonham-Carter, G. F (1996) Geographic information systems for geoscientists: modelling with GIS. Computer Methods in the Geosciences. Vol. 13, Pergamon Publications. 398 p
- Booch, G (1994) Object-oriented analysis and design with applications, 2nd. Edition, Addison-Wesley Publishing Co., Menlo Park, CA., 589 p
- Borgefors, G (1984) Distance transformations in arbitrary dimensions. Computer Vision, Graphics, and Image Processing. 27, pp. 321-345
- Borgefors, G (1986) Distance transformations in digital images. Computer Vision, Graphics, and Image Processing. 34, pp. 344-371
- Bouloucos, T. Ayugi, S.W.O, Kufuniyi, O (1993) Data structure for multi-valued vector maps, Proc. Fourth European Conference on Geographical Information Systems (EGIS'93). Genoa, Italy, pp. 237-245
- Bouloucos. T, Kufuniyi, O., Molenaar, M (1990) A relational data structure for single valued vector maps. International Archives of Photogrammetry and Remote Sensing, Vol. 28, Part 3/2, Commission III, Wuhan, China, pp. 64-74
- Bowyer, A (1981) Computing Dirichlet tessellation. Computer Journal, 24, pp. 162-166
- Brassel, K.E, Reif, D (1979) Procedure to generate Thiessen polygons. Geographical Analysis. 11, pp. 289-303
- Bric, V (1993) 3D vector data structures and modelling of simple objects in GIS. M. Sc. Thesis, ITC, Enschede, The Netherlands, 107 p
- Bric, V, Pilouk, M, Tempfli, K (1994), Towards 3D-GIS: Experimenting with a Vector Data Structure. Proc. of the Symposium on Mapping and Geographic Information Systems. Georgia, USA, ISPRS Archives Vol. 30, Part 4, pp. 634-640
- Bric, V, Pilouk, M (1994) Computation of topologic space. ITC, Enschede, The Netherlands
- Bric, V, Pilouk, M, Tempfli, K (1994). Towards 3D-GIS: Experimenting with a vector data structure. International Archives of Photogrammetry and Remote Sensing. Vol. XXX, Part 4, Athens, Georgia, USA, pp. 634-640.
- Bric, V (1993) 3D vector data structures and modelling of simple objects in GIS. M.Sc. Thesis, ITC, Enschede, The Netherlands.
- Brockschmidt, K (1993) Programming for Windows with Object Linking and Embedding 2.0. Microsoft Press
- Brunet, P (1992) 3-D structures for the encoding of geometry and internal properties, In: Three-Dimensional Modeling with Geoscientific Information Systems by A. K. Turner (ed.). NATO ASI Series C, Kluwer Academic Publishing, Dordrecht, Vol. 354, pp. 159-188
- Burrough, P.A (1986) Principles of geographical information systems for land resources assessment. Clarendon Press, Oxford University Press, 194 pp
- Cambray, B. de, (1993) Three-dimensional (3D) modelling in a geographical database. Proc. 11th International Symposium on Computer Assisted Cartography (AUTOCARTO 11). Minneapolis, pp. 338-347.
- Cambray, de B, Yeh, T. S (1994) A multidimensional (2D, 2.5D, and 3D) geographical data model. International Conference on Management of Data

- (COMAD'94). Bangalore, India, Tata Mc Graw-Hill, pp.317-336, http://www.prism.uvsq.fr/public/beatrix/publi_en.html
- Cantor, G (1880) Über unendliche, lineare Punktmannigfaltigkeiten. *Math. Ann.* (B) 17, pp. 355-388
- Carlson, E (1987) Three dimensional conceptual modeling of subsurface structures. *Technical Papers, Vol. 4, ASPRS-ACSM Annual Convention*. Baltimore, Maryland, pp. 188-200
- Chen, P. PS (1983) The entity-relationship approach to information modelling & analysis. *Proc. International Conference*. North-Holland
- Chen, TK, and Abdul-Rahman, A (2006) 0D feature in 3D planar polygon testing for 3D spatial analysis. In: Abdul-Rahman, Coors, Zlatanova (eds.) *Innovations in 3D geo information systems*. Springer. Germany
- Chen, X., Ikeda, K., Yamakita, K., Nasu, M (1994) Raster algorithms for generating Delaunay tetrahedral tessellations. *International Archives of Photogrammetry and Remote Sensing. Commission III, Vol. 30, Part 3/1, Munich, Germany*, pp. 124-131
- Chew, LP (1989). *Constrained Delaunay triangulations*. *Algorithmica* 4, pp. 97-108
- Chhatkuli, RR (1993) Modelling data quality parameters in a multiple-theme vector data structure and its implementation in a geographic information system. *M.Sc. Thesis, ITC, Enschede, The Netherlands*
- Collin, WJ (1992) *Data structures: an object-oriented approach*. Addison-Wesley. Reading Massachusetts, 624 pp
- Cöltekin A (2002) *An Analysis of VRML-based 3D Interfaces for Online GIS: Current Limitations and Solutions*. *Surveying Science in Finland*. Vol.20, No: 1-2, p.80-91
- Connolly, T, Begg, C (2002) *Database Systems – A Practical Approach To Design, Implementation and Management*. 3rd Edition, Pearson Addison-Wesley. Menlo Park, California.
- Coors V (2003) 3D-GIS in Networking Environments. *Computer, Environments and Urban Systems, Vol. 27/4, 2003, Special Issue 3D cadastre*, pp 345-357.
- Coors V, Jung, V (1998) Using VRML as an Interface to the 3D Data Warehouse. *Proceedings of the third symposium on the Virtual reality modeling language, Monterey, California, United States* , pp 121-140.
- Corbett, JP (1979) *Topological principles in cartography*. Technical paper 48, U.S. Department of Commerce, Bureau of the census, 50 pp
- Dahl, OJ, Myrhaug, B, Nygaard, K (1970) *SIMULA common base language*. Norwegian Computing Center S-22, Oslo, Norway
- Danielsson, P.E (1980) Euclidean distance mapping. *Computer Graphics and Image Processing*. 14, pp. 227-248
- Date, C.J (1986) *An introduction to database systems*. Vol. 1, Addison-Wesley, Reading, Mass.
- De Floriani, L, Puppo, E (1988) Constrained Delaunay triangulation for multi resolution surface description. *Proc. of the 9th International Conference on Pattern Recognition*. Rome, Italy, pp. 566-569

- De Floriani, L, Puppo, E (1992) An on-line algorithm for constrained Delaunay triangulation. *CVGIP: Graphical Models and Image Processing*. 54, pp. 290-300
- Delaunay, B (1934) Sur la sphère vide. *Bulletin of the Academy of Sciences of the USSR. Classe des Sciences Mathématiques et Naturelles*, 8, pp. 793-800
- Delobel, C., Lecluse, C, Richard, P (1995) *Database: from relational to object-oriented systems*. International Thomson Computer Press. London, 382 p
- Devlin, K (1994) *Mathematics: The sciences of patterns*. Scientific American Library, New York, 215 pp
- Diehl S. (2001) *Distributed Virtual Worlds*. Springer-Verlag, Berlin Heidelberg New York
- Dirichlet, G.L (1850) Über die reduction der positiven quadratischen formen mit drei unbestimmten ganzen zalen, *J. Reine u. Angew. Math.* 40, pp. 209-227
- DLG-E, *Digital Line Graph-Enhanced*, U.S. Department of the Interior, U.S. Geological Survey
- Dong, F (1996) *Three-dimensional models and applications in subsurface modeling*. Department of Geomatics Engineering Reports No. 20093. University of Calgary, 93 p
- Dwyer, R.A (1987) A fast divide-and-conquer algorithm for constructing Delaunay triangulations. *Algorithmica*. Vol. 2, pp. 137-151
- Dykes J.A, Moore K.E, Fairbairn D (1999) From Chernoff to Imhof and Beyond: VRML and Cartography. *Proc. of 4th Int. Conference on the VRML and Web3D Technologies (VRML99)*. Paderborn, Germany.
- Ebner, H, Eder, K (1992) State-of-the-art in digital terrain modelling. *Proc. 3rd. European Conference on Geographical Information Systems (EGIS'92)*. Volume. 1, Munich, Germany, pp. 681-690.
- Ebner, H, Hossler, R, Wurlander, R (1990) Integration of an efficient DTM program package into geographical information systems. *International Archives of Photogrammetry and Remote Sensing*. Vol. 28, Part 4, Commission IV, Tsukuba, Japan, pp. 116-121
- Edelsbrunner, H, Preparata, FP, West, DB (1986) Tetrahedrizing point sets in three dimensions. *Technical Report UIUCDCS-R-86-1310*. Department of Computer Science, University of Illinois, 1304 W. Springfield Avenue, URBANA, IL 61801
- Egenhofer, MJ (1991) Extending SQL for cartographic display. *Cartography and Geographic Information Systems*. Vol. 18, No. 4, pp. 230-245
- Egenhofer, MJ (1990) Interaction with geographic information systems via spatial queries. *Journal of Visual Languages and Computing*. Vol. 1, No. 4, pp. 389-413
- Egenhofer, MJ (1989) A formal definition of binary topological relationships. *Technical Report No. 101*. NCGIA/Department of Surveying Engineering, University of Maine. Orono, ME, USA
- Egenhofer, MJ, Frank, AU (1989) Object-oriented modelling in GIS: Inheritance and propagation. *Proc. 9th International Symposium on Computer Assisted Cartography (AUTOCARTO 9)*. Baltimore, Maryland, pp. 588-589
- Egenhofer, MJ, Frank, AU, Jackson, JP (1989) A topological data model for spatial databases. *NCGIA Technical Report, No. 104*

- Egenhofer, MJ, Franzosa, RD (1991) Point-set topological spatial relations. *International Journal for Geographical Information Systems*. Vol. 5, No. 2, pp. 161-174
- Egenhofer, MJ, Herring, JR (1990) A mathematical framework for the definition of topological relationships. *Proc. of the Fourth International Symposium on Spatial Data Handling*. Zurich, Switzerland, pp. 803-813.
- Egenhofer, MJ, Herring, JR (1992) Categorizing binary relationships between regions, lines, and points in geographical databases. Technical report, Department of Surveying Engineering, University of Main, USA
- Ehlers, M, Greenlee, D, Smith, T, Star, J (1991) Integration of remote sensing and GIS: Data and data access. *Photogrammetric Engineering & Remote Sensing*, Vol. 57, No. 6, pp. 669-675
- Ehlers, M, Edwards, G, Bédard (1989) Integration of remote sensing with geographic information systems: a necessary evolution. *Photogrammetric Engineering & Remote Sensing*. Vol. 55, No. 11, pp. 1619-1627
- Fang, T P, Piegl, LA (1993) Delaunay triangulation using a uniform grid. *IEEE Computer Graphics & Applications*. May 1993, pp. 36-47
- Fang, T P, Piegl, LA (1995) Delaunay triangulation in three dimensions, *IEEE computer Graphics & Applications*. September, 1995, pp. 62-69
- Field, AD (1986) Implementing Watson's algorithm in three dimensions. *Proc. of ACM Symposium on Computational Geometry*. pp. 246-259
- Field, AD, Smith, WD (1991) Graded tetrahedral finite element meshes. *International Journal for Numerical Methods in Engineering*. 31(3), pp. 413-425
- Finkbeiner, DT, Lindstrom, WD (1987) A primer of discrete mathematics. W.H. Freeman and Company. New York, 363 pp
- Fisher, TR (1993) Use of 3D geographic information systems in hazardous waste site investigations. In: Goodchild, M.F., Parks, B., and Steyaert, L., (Eds.), *Environmental Modeling with GIS*. Oxford University Press. New York
- Flankin, WM (1984) Cartographic errors symptomatic of underlying algebra problems. In: Marble, D, et al. (Eds.) *Proc. of the International Symposium on Spatial Data Handling*. Zurich, Switzerland
- Flavin, M (1981) Fundamental concepts of information modelling. Yourdon Press Computing Series. Prentice-Hall, Inc., Englewood Cliffs, New Jersey, USA 128 pp
- Flowerdew, R (1991) Spatial data integration. In: Maguire, DJ, Goodchild, MF, Rhind, DW, (Eds.) *Geographical information systems principles and applications*. Longman Scientific & Technical, pp. 375-387
- Foley, JD, van Dam, A, Feiner, SK, Hughes, JF (1992) *Computer graphics: principles and practice*. Second Edition, Addison-Wesley. USA, 1175 pp
- Förstner, W, Pallaske, R (1993) Mustererkennung und 3D-Geoinformationssysteme. *ZPF*, 61. Jg., 5/1993, pp. 167-177
- Forstner, W (1995) GIS - the third dimension, Workshop on Current Status and Challenges of Geoinformation Systems. IUSM working group on LIS/GIS. University of Hannover, Germany, pp. 65-72
- Frank, AU (1992) Spatial concepts, geometric data models and data structures. *Computer & Geosciences*. Vol. 18, No. 4, pp. 409-417

- Frank, AU, Kuhn, W (1986) Cell graphs: a provable correct method for the storage of geometry. Proc. of the Second International Symposium on Spatial Data Handling. Seattle, Washington, USA, pp. 411-436
- Fréchet, M (1906) Sur quelques points du calcul fonctionnel. Rendiconti di Palermo 22, 1-74
- Fritsch, D (1990) Towards three-dimensional data structures in geographic information systems. Proc. First European Conference on Geographical Information Systems (EGIS'90). Volume 1, Amsterdam, The Netherlands, pp. 335-345
- Fritsch, D, Pfannenstein, A (1992a) Integration DTM data structures into GIS data models. International Archives of Photogrammetry and Remote Sensing. Vol. XXIX, Part B3, Commission III, Washington, D.C., USA., pp. 497-503
- Fritsch, D, and Pfannenstein, A (1992b) Conceptual models for efficient DTM integration into GIS. Proc. Third European Conference on Geographical Information Systems (EGIS'92). Volume. 1, Munich, Germany, pp. 701-710
- Fritsch, D, Schmidt, D (1995) The object-oriented DTM in GIS. Proc. of Photogrammetric Week. Stuttgart, pp. 29-34
- Fritsch, D (1996) Three-dimensional geographic information systems - status and prospects. International Archives of Photogrammetry and Remote Sensing (ISPRS). Vienna, Vol. 31, Part 4, pp. 215-221
- Gargantini, I (1992) Modelling natural objects via octrees. In: Three-dimensional modeling with geoscientific by A. K. Turner (Ed.). NATO ASI Series, Kluwer Academic Publishers. pp. 145-157
- Gatrell, AC (1991) Concepts of space and geographical data. In: Maguire, DJ, Goodchild, MF, Rhind, DW (Eds.). Geographical Information Systems. Vol. 1: Principles. Longman. UK
- Geographical Information Science, Vol. 17, No.5, pp. 411-430
- GEONOVA (2003) *Newsletter Q3/2003*
- Giblin, P (1977) Graphs, surfaces and homology. Chapman and Hall, London
- Gröger, G, Kolbe, T, Dress, R, Müller, H, Knopse, F, Gruber, U, and Krause, U (2004) Das interoperable 3D-Stadtmodell der SIG 3D der GDI NRW. Version 2. Stand: 10.5.2004
(URL: http://www.ikg.uni-bonn.de/sig3d/docs/Handout_04_05_10.pdf)
- Goldberg, A, Robson, D (1983) Smalltalk-80: the language and its implementation. Addison-Wesley, Reading, Massachusetts
- Golda, YV (1992) The "flowing" accumulation method and its application for earth surface analysis. International Archives of Photogrammetry and Remote Sensing. Vol. XXIX, Part B4, Commission IV, Washington, D.C., USA. pp. 836-842
- Gorte, B, Koolhoven, W (1990) Interpolation between isolines based on the Borgfors distance transform. ITC Journal - Special Issue Remote Sensing and GIS, 1990-3. pp. 245-247
- Green, P J, and Sibson, R (1978) Computing Dirichlet tessellations in the plane. Computer Journal, 21, pp. 168-173
- Gruen, A, Streilein, A, Stallmann, D, Dan, H (1993) Automation of house extraction from aerial and terrestrial images. Conference ASIA. Wuhan, China

- Guptill, C, Morrison, JL (1995) Elements of spatial data quality. Elsevier Science Ltd.
- Guo, W (1996) Three-dimensional representation of spatial object and topological relationships. International Archives of Photogrammetry and Remote Sensing. Vol. XXXI, Part B3, Commission 3, K. Kraus and P. Waldhausl (eds.), XXXI International Congress of Photogrammetry and Remote Sensing, Vienna, pp. 273-278
- Gütting, R (1988) Geo-relational algebra: a model and query language for geometric database system. In: Schmidt, J, Ceri, S, Missikoff, M (Eds.) Advances in Database Technology--EDBT '88, International Conference on Extending Database Technology. Venice, Italy, Lecture Notes in Computer Science, Springer Verlag, New York, Vol. 303, pp. 506-527
- Gütting, H (1994) An Introduction to Spatial Database Systems. VLDB Journal 3, Hans-J. Schenk (Ed.), pp.357-399, 1994
- Guttman, A (1984) A dynamic index structure for spatial searching. Proc.of the SIGMOD Conference. Boston, pp. 47-57
- Hausdorff, F (1914) Grundzüge der mengenlehre. Leipzig. Reprinted by Chelsea, New York. 88 pp
- Hawryszkiewicz, IT (1991) Introduction to system analysis and design. Second edition, Prentice Hall, Australia
- Hearnshaw, HM, Unwin, DJ (1994) Visualization in geographical information systems. Wiley and Sons, 243 pp
- Herring, JR (1989) A fully integrated geographic information system. Proc. 9th International Symposium on Computer Assisted Cartography (AUTOCARTO 9). pp. 828-837
- Herring, RJ, Egenhofer, MJ (1990) A mathematical framework for the definition of topological relationships. Proc. of the Forth International Symposium on Spatial Data Handling. Zurich, Switzerland, pp. 803-813
- Herring, J, Larsen, R, Shivakumar, J (1988) Extensions to the SQL language to support spatial analysis in a topological data base. Proc. GIS/LIS '88. San Antonio, Texas, pp. 741-750
- Hesse, W, Leahy, FJ (1990) Authoritative topographic-cartographic information system (ATKIS). The Project of the State Survey Authorities for the Creation of Digital Landscape Models and Digital Cartographic Models. Landesvermessungamt Nordrhein-Westfalen, Bonn, 29 pp
- Houlding, S W (1994) 3D geoscience modelling: computer techniques for geological characterization. Springer-Verlag, Berlin, 309 p
- Howe, DR (1989) Data analysis for database design. Second edition, Edward Arnold A Division of Hodder & Stoughton, London. 317 pp
- Illustra, (1994) Illustra, relational databases and spatial data. An Illustra Technical White Paper by Malcolm Colton, Oakland, CA, 6 pp
- Institute for Photogrammetry (ifp) (1997) Working Group IV/2: Digital Terrain Models, Orthoimages, and 3D GIS. University of Stuttgart, Germany. <http://www.ifp.uni-stuttgart.de/comm4/wgIV2.html>

- Intergraph, (1995) New OLE extensions for CAD/CAM/CAE and GIS adopted, Press Releases. Intergraph Corp., Huntsville, <http://www.intergraph.com/press95/dmpr.html>.
- Jackins, C L, Tanimoto, SL (1980) Oct-trees and their use in representing three-dimensional objects. *Computer Graphics and Image Processing*. Vol. 14, pp. 249-270
- Jackson, J (1989) Algorithms for triangular irregular networks based on simplicial complex theory. ASPRS-ACSM Annual Convention. Baltimore, MD, USA., pp. 131-136
- Jackson, MA (1983) *System development*, Prentice Hall, 418 pp.
- Jansen R (2003) Oracle, Java, XML: Integration in Oracle9i. Frankfurt, Germany.
- Jianya, G, Deren, L (1992) Object-oriented data models in GIS. *International Archives of Photogrammetry and Remote Sensing*. Vol. XXIX, Part B3, Commission 3, W. Fritz and J. R. Lucas (eds.), XXIX International Congress of Photogrammetry and Remote Sensing, Washington, pp. 773-779
- Joe, B (1989) Three-dimensional triangulations from local transformations. *Siam Journal on Scientific and Statistical Computing*, 10(4), pp. 718-741
- Jones, CB (1989) Data structures for three-dimensional spatial information systems in geology, *International Journal of Geographical Information Systems*. Vol.3, No. 1, Taylor & Francis, London. pp. 15-31
- Kainz, W (1989) Order, topology and metric in GIS. ASPRS-ACSM Annual Convention, Baltimore, Vol. 4, pp. 154-160
- Kainz, W (1990) Spatial relationships--topology versus order. Proc.of the Fourth International Symposium on Spatial Data Handling. Zurich, Switzerland, Brassel, K, and Kishimoto, H, (Eds.), Vol. 2, pp. 814-819
- Kainz, W, Egenhofer, M, Greasley, I (1993) Modeling spatial relations and operations with partially ordered sets. *International Journal of Geographical Information Systems*, Vol. 7, No. 3, pp. 215-229
- Kainz, W, Shahriari, N (1993) Object-oriented tools for designing topographic databases. Proc. GIS/LIS'93. pp. 341-350
- Kanaganathan, S, Goldstein, NB (1991) Comparison of four-point adding algorithms for Delaunay-type three-dimensional mesh generators. *IEEE Transactions on Magnetics*. 27(3), pp. 3444-3451
- Kavouras, M, Masry, S (1987) An information system for geosciences, design considerations. Proc. 8th International Symposium on Computer Assisted Cartography (AUTOCARTO 8). Baltimore, MD, pp. 336-345
- Kemp, Z (1990) An object-oriented model for spatial data. Proc. 4th. International Symposium on Spatial Data Handling. Vol. 2, Zurich, Switzerland, pp. 659-668
- Kinsey, LC (1993) *Topology of surfaces*. Springer Verlag. New York, 276 pp
- Knuth, DE (1973) *The Art of computer programming*. Vol. 3: Sorting and Searching, Addison-Wesley, Reading
- Kofler, M (1998) R-trees for Visualizing and Organizing Large 3D GIS Databases. Dissertation TU Graz, Austria
- Kolbe, A (2003) Applications and Solutions for Interoperable 3D Geovisualization. Proc. of the Photogrammetric Week 2003. Stuttgart, Germany.

- Kraak, MJ (1992) Working with triangulation-based spatial data in 3D space. *ITC Journal* 1992-1, pp. 20-33
- Kraak, MJ, Verbree, E (1992) Tetrahedrons and animate maps in 2D and 3D space. In: Proc. of the 5th International Symposium on Spatial Data Handling. pp. 63-71
- Kraus, K (1995) From digital elevation model to topographic information system. 45th. Photogrammetric Week. D. Fritsch and D. Hubbie (eds.), Stuttgart, pp. 277-285
- Kufoniya, O (1989) Editing of topologically structured data. M.Sc. Thesis. ITC, Enschede, The Netherlands
- Kufoniya, O, Bouloucos, T (1994) Flexible integration of terrain objects and DTM in vector GIS. Proceedings International Colloquium on Integration, Automation and Intelligence in Photogrammetry, Remote Sensing and GIS. Wuhan, pp. 111-122
- Kufoniya, O (1995) Spatial coincidence modelling, automated database updating and data consistency in vector GIS. Ph.D. Thesis. Wageningen Agricultural University, The Netherlands, 206 pp
- Kufoniya, O (1995b) An introduction to object-oriented data structures. *ITC Journal* 1995-1, pp. 1-7
- Kuhn, W, Frank, AU (1991) A formalization of metaphors and image-schemas in user interfaces. In: Mark, D, Frank, A (Eds.) Cognitive and linguistic aspects of geographic space. Kluwer Academic Publ., Dordrecht, pp. 419-434
- Kwan, MP, Lee, J (2003) Emergency response after 9/11: the potential of real-time 3D GIS for quick emergency response in micro-spatial environments. (<http://dx.doi.org/10.1016/j.compenvurbsys.2003.08.002>).
- Lammersen R. van, Hoogerwerf, T (2003) Geo-Virtual reality and Participatory Planning. CGI Report 2003-07, Wageningen, The Netherlands
- Langran, G (1992) Time in geographic information systems. Taylor & Francis. London.
- Larkin, BJ (1991) An ANSI C program to determine in expected linear time the vertices of the convex hull of a set of planar points. *Computers & Geosciences*. 17, pp. 431-443
- Lattuada, R, Raper, J (1995) Applications of 3D Delaunay triangulation algorithms in geoscientific modeling. GISRUk'95 Conference. U.K, <http://www.bbk.ac.uk/departement/geography/jonathanraper.html>
- Laurini, R, Thompson, D (1993) Fundamentals of spatial information systems. *Academic Press*, London, 680 p
- Laurini, R (2001) Information System For Urban Planning – A hypermedia cooperative approach. London New York
- Lawson, CL (1985) Some properties of n-dimensional triangulation. External Report, JPL Publication 85-42. National Aeronautics and Space Administration.
- Lawson, CL (1977) Software for C1 surface interpolation. In Rice, J (Ed.) Mathematical Software III. Academic Press. Newyork, USA, pp. 161-194
- Lawson, CL (1972) Generation of a triangular grid with application to contour plotting. California Institute of Technology, Jet Pollution Laboratory. Technical Memorandum No. 299

- Leach, R (1995) Object-oriented design and programming with C++. AP Professional. London. 463 p
- Lee, DT, Lin, AK (1986) Generalized Delaunay triangulation for planar graph. *Discrete & Computational Geometry*. 1, pp. 201-217
- Lee, DT, Schachter, BJ (1980) Two algorithms for constructing a Delaunay triangulation. *International Journal of Computer and Information Sciences*. 9, pp. 219-242
- Lopez, X (2003) Oracle Database 10g: A Spatial VLDB Case Study. Oracle Cooperation Whitepaper.
(URL:http://otn.oracle.com/products/spatial/pdf/customer_success/papers/spatial_10g_ow2003.pdf).
- Lewis, BA, Robinson, JS (1978) Triangulation of planar regions with applications. *Computer Journal*. 21, pp. 324-332
- Lingas, A (1986) The greedy and Delaunay triangulations are not bad in the average case. *Information Processing Letters*. 22, pp. 25-31
- Li, R (1993) Three-dimensional GIS: a simple extension in the third dimension? ACSM/ASPRS Annual Convention. New Orleans, USA. Vol. 3, pp. 218-227
- Li, R (1994) Data structures and application issues in 3-D geographic information systems. *Geomatica*. Vol. 48, No. 3, pp. 209-224
- Li, R, Chen, Y, Dong, F, Qian, L, Hughes, JD (1996) 3D data structures and applications in geological subsurface modelling. *International Archives of Photogrammetry and Remote Sensing*. Vol. XXXI, Part B4, Commission 4, K. Kraus and P. Waldhausl (eds.), XXXI International Congress of Photogrammetry and Remote Sensing, Vienna, pp. 508-513
- Liu, CL (1986) Elements of discrete mathematics. Second edition, McGraw-Hill, 433 pp
- Nebiker, S (2003) Support For Visualization and Animation in a Scalable 3D GIS Environment: Motivation, Concepts and Implementation. *International Archives of Photogrammetry, Remote Sensing and Spatial Information Science*, Vol. XXXIV-5/W10
- Macedonio, G, Pareschi, MT (1991) An algorithm for the triangulation of arbitrarily distributed points: applications to volume estimate and terrain fitting. *Computer & Geosciences*. 17, pp. 859-874
- Maguire, DJ, Dangermond, J (1991) Functionality of GISs. In: Maguire, DJ, Goodchild, MF, Rhind, DW (Eds.) *Geographical Information Systems*. Vol. 1, Principles, Harlow: Longman Scientific & Technical, pp. 319-335
- Maguire, D.J., Goodchild, M.F., and Rhind, D.W., (Eds), 1991, *Geographical information systems: principles and applications*. Longman Scientific & Technical.
- Makarovic, B (1984) Structures for geo-information and their application in selective sampling for digital terrain models. *ITC Journal* 1984-4, pp. 285-295
- Makarovic, B, (1977) Composite sampling for DTMs, *ITC Journal*
- Males, RM (1978) ADAPT - a spatial data structure for use with planning and design models. In: Dutton, G., (Ed.), *First International Symposium on Advance Study on Topological Data Structures for Geographic Information Systems*, Vol. 3, 19 pp

- Manacher, GK, Zobrist, AL (1979), Neither the greedy nor the Delaunay triangulation of a planar point set approximates the optimal triangulation. *Information Processing Letters*, 9, pp. 31-34
- Mäntylä, M (1988) *Solid modelling*. Computer Science Press. Rocville, Maryland, 401 pp
- MAP24 (2004). (<http://www.map24.de/>).
- Marble, DF, Calkins, HW, Peuquet, DJ (1984) Technical description of the DIME system. *Basic Readings in Geographic Information Systems*. SPAD Systems, Ltd. USA., pp. 57-64
- Mark, DM, Cebrian, JA (1986) Octrees: a useful data-structure for the processing of topographic and sub-surface data. *Technical Papers of ACSM-ASPRS Annual Convention*. Vol. 1 (Cartography and Education)
- Mark, DM, Lauzon, JP, Cebrian, JA (1989) A review of quadtree-based strategies for interfacing coverage data with digital elevation models in grid form. *International Journal of Geographical Information Systems*. Vol.3, No. 1, Taylor & Francis, London, pp. 3-14
- Martin, J (1983) *Managing the data-base environment*. Prentice-Hall, Inc., Englewood Cliffs, New Jersey
- Maus, A (1984) Delaunay triangulation and the convex hull of n points in expected linear time. *BIT*, 24, pp. 151-163
- McCullagh, MJ, Ross, CG (1980) Delaunay triangulation of a random data set for isarithmic mapping. *The Cartographic Journal*. 17, pp. 93-99
- Meagher, D (1982) Geometric modelling using octree encoding. *Computer Graphics and Image Processing*. Vol. 19, pp. 129-147
- Meier, A (1986) Applying relational database techniques to solid modelling. *CAD*. Vol.18, No.6, pp. 319-326
- Meij, L. v.d (1992) *Topologische relaties en bevragingen in de formele datastructuur voor drie-dimensionele vectorkaarten*. Scriptie, LU Wageningen, The Netherlands
- Microsoft, (1993) *Object linking and embedding: OLE 2.0 design specification*, Microsoft Corporation
- Midtbø, T (1996) *Spatial modelling by delaunay networks of two and three dimensions*. PhD thesis. Norwegian Institute of Technology. University of Trondheim, Norway, <http://guran1.iko.unit.no/home/terjem/terjem.html>
- Midtbø, T (1993a) Incremental Delaunay tetrahedrization for adaptive data modelling. *Proc. Fourth European Conference on Geographical Information Systems (EGIS'93)*. Genoa, Italy, pp. 227-236
- Midtbø, T (1993b) *Spatial modelling by Delaunay networks of two and three dimensions*, Dr. Ing. Thesis, Norwegian Institute of Technology, University of Trondheim, Norway, 147 pp
- Miller, CL, Laflamme, RA (1958) The digital terrain model - theory and application. *Photogrammetric Engineering*. pp. 433-442
- Mirante, A, Weingarten, N (1982) The radial sweep algorithm for constructing triangulated irregular networks. *IEEE Computer Graphics and Applications*. 2, pp. 11-21

- Moellering, H (1991) Spatial database transfer standards: current international status. Elsevier Applied Science. 247 pp
- Moise, EE (1977) Geometric topology in dimension 2 and 3 Springer Verlag, New York
- Molenaar, M, Fritsch, D, Bill, R (1996) Conceptual aspects of GIS technology. ISPRS Congress Tutorial, Vienna
- Molenaar, M (1994a) A syntax for representation of fuzzy spatial objects. In: Molenaar, M, De Hoop, S (Eds.) Advanced geographic data modelling: spatial data modelling and query languages for 2D and 3D applications. Netherlands Geodetic Commission, No. 40, Delft, The Netherlands, pp. 155-169.
- Molenaar, M (1994b) A syntactic approach for handling the semantics of fuzzy spatial objects. European Science Foundation, GISDATA, Baden, Austria, 15 pp
- Molenaar, M (1993) Object hierarchies and uncertainty in GIS or why is standardisation so difficult?, Geo-Information-Systeme. Vol. 6, No. 4, pp. 22-28
- Molenaar, M (1992) A topology for 3D vector maps. ITC Journal. 1992-1, pp. 25-33
- Molenaar, M (1991) Formal data structures, object dynamics and consistency rules. Digital Photogrammetric Systems. Herbert Wichmann Verlag GmbH, Karlsruhe, pp. 262-273
- Molenaar, M (1990) A Formal data structure for 3-D vector maps. Proceedings First European Conference on Geographical Information Systems (EGIS'90). Volume. 2, Amsterdam, The Netherlands, pp. 770-781.
- Molenaar, M (1989) Single valued vector maps - a concept in GIS, Geo-Information-Systeme. Vol. 2, No. 1, pp. 18-27
- Molenaar, M (1988) Single valued polygon maps. International Archives of Photogrammetry and Remote Sensing. Vol. 27, Part B4, Commission IV, Kyoto, Japan, pp. 592-601
- Ning, S (1992) On the principles and the approaches of implementing the strict digital geometric rectification for SPOT imagery. International Archives of Photogrammetry and Remote Sensing. Vol. XXIX, Part B3, Commission III, Washington, D.C., USA., pp. 32-34
- OGC (2001) Web Map Service Implementation Specification. (<http://www.opengis.org/docs/01-068r2.pdf>)
- OGC (2002) Web Feature Service Implementation Specification. (www.opengis.org/docs/02-058.pdf).
- OGC (2003a) Geographic Markup Language (GML 3). (<http://www.opengis.org/docs/02-023r4.pdf>).
- OGC (2003b) OpenGIS Reference Model. (<http://www.opengis.org/docs/03-040.pdf>).
- Oosterom P van, Stoter J, Quak W, Zlatanova S (2002) The Balance Between Geometry and Topology. Proc. of Spatial Data Handling. Ottawa, Canada
- Oosterom, P. van (1990) Reactive data structures for geographic information systems, PhD Thesis. Leiden University. The Netherlands, 197 pp
- Orenstein, JA (1990) An object-oriented approach to spatial data processing. Proc. of the 4th International Symposium on Spatial Data Handling. Vol. 2, Zurich, Switzerland, pp. 669-698

- Peng, W, Molenaar, M (1995) An object-oriented approach to automated generalization. Proc. of GeoInformatics '95. Vol. 1, Hong Kong, pp. 295-304
- Peng, W, Tempfli, K, Molenaar, M (1995) Automated generalization in a GIS context. Proceedings of GeoInformatics '96. Florida, USA, 11 pp
- Peng, Y.R, Tsou, MH (2003) Internet GIS – Distributed Geographic Information Services for the Internet and Wireless Networks. Hoboken, New Jersey, USA. POET Software Corporation,(1996) Why use an ODBMS?. POET Technical References, http://www.poet.com/t_oovsre.htm#ODBMS
- Petchenik, BB (1991) New directions for national mapping. URISA, Vol.3, No.1, pp.77-79
- Petrie, G, Kennie, TJM (1990) Terrain modelling in surveying and civil engineering. Whittles Publishing. Glasgow, 351 p
- Peucker, T, Chrisman, N (1975) Cartographic data structures. The American Cartographer. Vol. 2, No. 2, pp. 55-69
- Peucker, T K (1978) Data structures for digital terrain models: discussion and comparison. 1st. International Advanced Study Symposium on Topological Data Structures for Geographical Information Systems. Harvard Paper on GIS, Edited by G. Dutton, Vol. 5
- Peuquet, DJ (1988) Representations of geographic space: toward a conceptual synthesis. Annals of the Association of American Geographers. 78, pp. 375-94
- Peuquet, DJ (1986) The use of spatial relationships to aid spatial database retrieval. Proc. of the Second International Symposium on Spatial Data Handling, Seattle, WA
- Peuquet, DJ (1984) A conceptual framework and comparison of spatial data models. CARTOGRAPHICA. Vol. 21, No. 4, pp. 66-113
- Pfannenstein, A, Reinhardt, W (1993) Data analysis in geographical information systems in combination with integrated digital terrain models. Proc. Fourth European Conference on Geographical Information Systems (EGIS'93). pp. 1341-1349
- Pigot, S (1992) A topological model for a 3-D spatial information system. Proc. 5th International Symposium on Spatial Information Handling. Charleston, S.C., pp. 344-360
- Pigot, S (1991) Topological models for 3D spatial information systems. Proc. 10th International Symposium on Computer Assisted Cartography (AUTOCARTO 10). Technical Papers. ACSM-ASPRS, Annual Convention, Vol. 6, Baltimore, Maryland, USA., pp. 369-391
- Pilesjo, P, Michelson, DB, Hall-Konyves, KM (1992) Digital elevation models for identification of potential wetlands. International Archives of Photogrammetry and Remote Sensing. Vol. XXIX, Part B4, Commission IV, Washington, D.C., USA., pp. 817-822
- Pilouk, M, Radjabi Fard, A, Tempfli, K (1994) Local updating of TIN for the integrated DTM and GIS data structure. International Archives of Photogrammetry and Remote Sensing. Vol. XXX, Part 4, Athens, Georgia, USA, pp. 460-466

- Pilouk, M, Kufoniyi, O (1994) A relational data structure for integrated DTM and multitheme GIS. *International Archives of Photogrammetry and Remote Sensing*. Commission III, Vol. 30, Part 3/2, Munich, Germany, pp. 670-677
- Pilouk, M, Tempfli, K, Molenaar, M (1994) A tetrahedron-based 3D vector data model for geoinformations. In: Molenaar, M, De Hoop, S (Eds.) *Advanced geographic data modelling: spatial data modelling and query languages for 2D and 3D applications*. Netherlands Geodetic Commission, No. 40, Delft, The Netherlands, pp. 129-140
- Pilouk, M, Tempfli, K (1994) An object oriented approach to the unified data structure of DTM and GIS. *International Archives of Photogrammetry and Remote Sensing*. Vol. XXX, Part 4, Athens, Georgia, USA, pp. 672-679
- Pilouk, M, Tempfli, K (1994) Integrating DTM and GIS using a relational data structure. *GIS'94*. Vol. 1, Vancouver, Canada, pp. 163-169
- Pilouk, M, Tempfli, K (1993) An integrated DTM-GIS data structure: a relational approach. *Proc. of 11th International Symposium on Computer Assisted Cartography (AUTOCARTO 11)*. Minneapolis, Minnesota, USA, pp. 278-287
- Pilouk, M, Tempfli, K (1992) A digital image processing approach to creating DTMs from digitized contours. *International Archives of Photogrammetry and Remote Sensing*, Vol. XXIX, Part B4, Commission IV, Washington, D.C., USA., pp. 956-961
- Pilouk, M (1992) Fidelity improvement of DTM from contours. M.Sc. Thesis. ITC, Enschede, The Netherlands
- Pilouk, M (1996) *Integrated Modelling for 3D GIS*. PhD Thesis. ITC Publication No. 40, 200 p
- Pohl, I (1993) *Object-oriented programming using C++*. Benjamin/Cummings Publishing Company, Inc., California, 496 pp
- Pullar, D (1988) Data definition and operators on a spatial data model. *ACSM-ASPRS, Annual convention*. Vol. 2, pp. 196-202
- Pullar, D, Egenhofer, M (1988) Towards formal definitions of topological relations among spatial objects. *Proc. of the 3rd. International Symposium on Spatial Data Handling*. Sydney, Australia, pp. 225-242
- Qingquan, L, Deren, L (1996) Hybrid data structure based on octree and tetrahedron in 3-D GIS. *International Archives of Photogrammetry and Remote Sensing*. Vol. XXXI, Part B, Commission 4, K. Kraus and P. Waldhausl (eds.), *International Congress of Photogrammetry and Remote Sensing*, Vienna, pp. 503-507
- Raper, J (1992) Key 3D modelling concepts for geoscientific analysis. In: *Three-dimensional modeling with geoscientific by A. K Turner* (ed.), NATO ASI Series, Kluwer Academic Publishings, pp. 215-232
- Raper, J (1990b) *Three-dimensional applications in geographic information systems*. Taylor & Francis, London, 189 p
- Raper, J (1993) *Three dimensional GIS for the 1990*. Seminar on Three Dimensional GIS - Recent Developments. ITC, Delft, The Netherlands, pp. 4-5
- Raper, J (1989) *The 3-dimensional geoscientific mapping and modelling system: a conceptual design*. In: Raper, J (Ed.) *Three dimensional applications in geographic information systems*. Taylor & Francis, London

- Raper, J (1990a) The 3-dimensional geoscientific mapping and modelling system: a conceptual design. In: Three Dimensional Applications in Geographic Information Systems, J. Raper (ed.) Taylor & Francis, pp. 11-19
- Raper, J, Kelk, B (1991) Three-dimensional GIS, In: Geographical information systems: principles and applications. D J Maguire, M Goodchild and DW. Rhind (eds.) Longman Geoinformation, pp. 299-317
- Requicha, AAG (1980) Representation for rigid solids: theory, methods, and systems, *Computing Surveys*. Vol. 12, No. 4
- Rhind, DW (1992) Spatial data handling in the geosciences. In: Three-Dimensional Modeling with Geoscientific Information Systems by A. K. Turner (ed.), NATO ASI Series C, Kluwer Academic Publishing, Dordrecht, Vol. 354, pp. 13-27
- Richardson, DE (1993) Automated spatial and thematic generalization using a context transformation model. PhD Thesis. R&B Publications, Canada, 149 pp
- Rijkers, R, Molenaar, M, Stuiver, J (1993). A query oriented implementation of 3D topologic datastructure. Proc. Fourth European Conference on Geographical Information Systems (EGIS'93). Genoa, Italy, pp. 1411-1420
- Roessel, JW van (1986) Design of a spatial data structure using the relational normal forms. Proceedings of the 2nd International Symposium on Spatial Data Handling. Seattle, pp. 251-272
- Rongxing Li (1994) Data structures and application issues in 3-D geographic information systems. *Geomatica*. Vol.48, No.3, pp. 209-224
- Roushannejad, AA (1993) Mathematical morphology in automatically deriving skeleton lines from digitized contours. M.Sc. Thesis. ITC, Enschede, The Netherlands
- Samet, H, Webber, RE (1988) Hierarchical data structures and algorithms for computer graphics: Part I – Fundamentals. *IEEE Computer Graphics and Applications*, May 1988, Vol. 8, pp. 48-68
- Samet, H (1990) Applications of spatial data structures. Addison-Wesley, 507 p
- Samet, H (1990) The design and analysis of spatial data structures. Reading, Addison-Wesley. Massachusetts
- Sandgaard, J (1988) Integration of a GIS and a DTM. *International Archives of Photogrammetry and Remote Sensing*. XVI Congress, Commission III, Kyoto, Japan, pp. 716-725
- Savarese DF (2003) Learning to Fly. *Java Pro Magazine*. June issue. http://www.fawcette.com/javapro/2003_06/magazine/features/dsavarese/.
- Scott, MS (1994) The development of an optimal path algorithm in three-dimensional raster space. MSc Thesis. Department of Geograh, University of South Carolina, 108 pp
- Seed, GM (1996) An introduction to object-oriented programming in C++ with application in computer graphics. Springer-Verlag, London, 1048 p
- Shamos, MI, Hoey, D (1975) Closest-point problems. Proc. of the 16th Annual Symposium on the Foundations of Computer Science (Washington: IEEE). pp. 151-162
- Shekar, S, Chawla, S (2003) *Spatial Databases – A Tour*. Pearson Education. New Jersey

- Shephard, MS, Schroeder, WJ (1990) A combined octree/Delaunay method for fully automatic 3-D mesh generation. *International Journal for Numerical Methods in Engineering*. 29, pp. 37-55
- Shepherd, IDH (1991) Information integration and GIS. In: Maguire, DJ, Goodchild, MF, Rhind, DW (Eds.) *Geographical information systems principles and applications - Vol. 1*. Longman Scientific & Technical, New York, USA, pp. 337-360
- Shibasaki, R, Shimizu, E, Nakamura, H (1990) Three dimensional (3D) digital map for an urban area. *International Archives of Photogrammetry and Remote Sensing*. Vol. 28, Part 4, Commission IV, Tsukuba, Japan, pp. 211-220.
- Shibasaki, R, Shaobo, H (1992) A digital urban space model - a three dimensional modelling technique of urban space in a GIS environment. *International Archives of Photogrammetry and Remote Sensing*. Vol. XXIX, Part B4, Commission IV, Washington, D.C., USA., pp. 257-264
- Shmutter, B, Doytsher, Y (1988) An algorithm to assemble polygons. *ACSM-ASPRS Annual Convention*. St. Louis, Missouri, pp. 98-105
- Shi, W (1994) Modelling positional and thematic uncertainties in integration of remote sensing and geographic information systems. PhD. Thesis. International Institute for Aerospace Survey and Earth Sciences, Enschede, The Netherlands, 147 pp
- Shi, W, Yang, B, Li, Q (2003) An object orientated data model for complex objects in three-dimensional geographical information systems. *International Journal of Geographical Information System*, Taylor & Francis, London
- Sibson, R (1978) Locally equiangular triangulations. *Computer Journal*. 21, pp. 243-245
- Sides, EJ (1992) Modelling three-dimensional geological discontinuities for mineral evaluation. PhD Thesis. University of London, 281 pp
- Singer, IM, Thorpe, JA (1967) *Lecture notes on elementary topology and geometry*. Scott Foresman & Co., Illinois, USA, 214 p
- Slingerland, R, Keen, TR (1990) A numerical study of storm driven circulation and 'event bed' genesis. *Proc. of Symposium on Structures and Simulating Processes*. *Freiburger Geowissenschaftliche Beitrage*, 2, pp. 97-99
- Sloan, SW (1987) A fast algorithm for constructing Delaunay triangulations in the plane. *Advanced Engineering Software*, 9, pp. 34-55
- Smith, HC (1985) Data base design: Composing fully normalized tables from a rigorous dependency diagram. *Communication of the ACM*. Vol. 28, No. 8, pp. 826-838
- Smith, TR, Menon, S, Star, JL, Estes, JE (1987) Requirements and principles for the implementation and construction of large-scale geographical information systems. *International Journal of Geographical Information Systems*. 1:13-32
- Smith, DR, Paradis, AR (1989) Three-dimensional GIS for the earth sciences. In: Raper, JF (ed.) *Three dimensional applications in geographical information systems*. Taylor & Francis, London. pp. 149-155
- Snyder, A (1993) The essence of objects: concepts and terms. *IEEE Software*. January, 1993, pp. 31-42

- Sommerville, DMY (1929) An introduction to the geometry of N dimensions. Dover publications, Inc., New York. 196 pp
- Special Interest Group (SIG) 3D (2004). Pilot 3D der GDI NRW – Ergebnisse. (URL:http://www.ikg.unionn.de/sig3d/docs/040109_Flyer_Endergebnis_3D-Pilot.pdf).
- Stanat, DF, McAllister, DF (1977) Discrete mathematics in computer science. Prentice-Hall. Englewood Cliffs, NJ
- Stoter J., and Oosterom P. van (2002) Incorporating 3D Geo-Objects into a 2D Geo-DBMS. Proceedings of ASPRS/ACSM. Washington, USA
- Stoter, J, Zlatanova, S (2003) 3D GIS - where are we standing. Joint Workshop on Spatial, Temporal and Multi-Dimensional Data Modeling and Analysis. Quebec City, Canada
- Stoter, J, Zlatanova, S (2003) Visualisation and editing of 3D objects organised in a DBMS. Proceedings of the EuroSDR Com V. Workshop on Visualisation and Rendering. Enschede, The Netherlands
- Sun Microsystems (2004) The Java 3D API. <http://java.sun.com/products/java-media/3D/>.
- Sutherland, IE, (1963) Sketchpad: A man-machine graphic communication system. TR-296, MIT Lincoln Laboratory, Lexington, Mass.
- Sutherland, IE (1970) Computer displays. In: Beatty, JC, Booth, K, (Eds.) IEEE Computer Society Press. Silver Spring, MD, pp. 4-20
- Taddei U. (2003) DEMViewer. <http://www.geogr.uni-jena.de/~p6taug/demviewer/demv.html>.
- Takahashi, M, Yokokawa, T, (1992) The automatic selection system of transmission line routes based on DTM. International Archives of Photogrammetry and Remote Sensing. Vol. XXIX, Part B4, Commission IV, Washington, D.C., USA. pp. 883-885
- Tang, L, (1992) Raster algorithms for surface modelling. International Archives of Photogrammetry and Remote Sensing. Vol. XXIX, Part B3, Commission III, Washington, D.C., USA., pp. 566-573
- Tansel, AU, Clifford, J, Gadia, S, Seger, A, Snodgrass, R (1993) Temporal databases, theory, design, and implementation. Benjamin/Cummings Publishing Company, Inc., California
- Tempfli, K (1986) Composit/progressive sampling - a program package for computer supported collection of DTM data. ACSM-ASPRS Annual Convention. Washington DC
- Tempfli, K (1982) Notes on interpolation and filtering. ITC Lecture Note. 3rd edition, ITC, Enschede, The Netherlands
- Tempfli, K, Makarovic, B (1978) Transfer functions of interpolation methods. ITC Journal 1978-1. pp. 50-78
- Thiessen, AH (1911) Precipitation averages for large areas. Monthly Weather Review, July, 39, pp. 1082-1084
- Thomas, D, (1989) What's in an object? *Byte*. March, 1989, pp. 231-240
- TIGER, Topologically integrated geographic encoding and referencing system. U.S. Department of Commerce, Bureau of the Census
- Tri-service data standard, (1994) CADD/GIS Technology Center

- Tsai, VJD (1993) Delaunay triangulations in TIN creation: an overview and a linear-time algorithm. *International Journal Geographical Information Systems*. Vol. 7, No. 6, Taylor & Francis Ltd., pp 501-524
- Tsai, VJD, Vonderohe, AP (1993) Delaunay tetrahedral data modelling for 3-D GIS applications. *Proc. GIS/LIS '93 Conference, Minneapolis, Minnesota*, Vol. 2, pp. 671-680
- Tsai, VJD, Vonderohe, AP (1991) A generalized algorithm for the construction of Delaunay triangulations in Euclidean n-space. *Proc. GIS/LIS '91 Annual Conference. Atlanta, GA*, Vol. 2, pp. 562-571
- Turner, AK (1989) The role of 3-D GIS in subsurface characterization for hydrogeological applications. In: Raper, JF (Ed.) *Three Dimensional Applications in Geographic Information Systems*. Taylor & Francis. London, pp. 115-127
- Vaidyanathaswamy, R (1960) *Set topology*. Chelsea Publishing Company, New York
- Voronoi, G (1908) Nouvelles applications des paramètres continus à la théorie des formes quadratiques. *Deuxième Mémoire: Recherches sur les paralléloèdres primitifs*. *Journal für die Reine und Angewandte Mathematik*. 134, pp. 198-287
- Wang, ZJ (1994) Digital photogrammetric data acquisition for 3D GIS. M.Sc. Thesis. ITC, Enschede, The Netherlands, 88 pp
- Watson, DF (1981) Computing the n-dimensional Delaunay tessellation with application to Voronoi polytopes. *Computer Journal*. 24, pp. 167-172
- Watson, DF, Philip, GM (1984) SURVEY: Systematic triangulations. *Computer Vision, Graphics and Image Processing*. Vol. 26, pp. 217-223
- Watt, A (1993) *3D computer graphics*. Addison-Wesley Publishing Company Inc., UK, 500 pp
- Webster, CJ (1990) The object-oriented paradigm in GIS. *International Archives of Photogrammetry and Remote Sensing. Commission III, Vol. 28 Part 3/2, Wuhan, China*, pp. 947-984
- Webster, CJ, Omare, CN (1991) A formal approach to object-oriented spatial database design. *Proc. of Second European Conference on Geographical Information Systems (EGIS'91)*. Vol. 2, Brussel, pp. 1210-1218
- Weibel, R (1993) On the integration of digital terrain and surface modeling into geographic information systems. *Proc. of 11th. International Symposium on Computer Assisted Cartography (AUTOCARTO 11)*. Minneapolis, pp. 257-266
- Weiskamp, K, Flamig, B (1992) *The Complete C++ Primer*. 2nd. edition, Academic Press, Inc., USA, 540 pp
- Willard, S (1970) *General topology*, Reading, Addison-Wesley, Massachusetts, USA. 369 pp
- Wilson, RJ (1985) *Introduction to graph theory*. 3rd. Edition, Longman Scientific & Technical. UK
- Wolberg, G (1990) *Digital image warping*. Los Alamo, IEEE Computer Society Press. Los Alamo. 318 pp
- Worboys, MF, Hearnshaw, HM, Maguire, DJ (1990) Object-oriented data modelling for spatial databases. *International Journal of Geographical Information Systems*. Taylor & Francis Ltd., Vol. 4, No. 4, pp. 369-383

- Vries, ME de, Zlatanova, S (2004) Interoperability on the Web: the case of 3D geo-data. IADIS International Conference on e-Society. Spain
- Vries ME de, Stoter, J (2003) Accessing 3D geo-DBMS using Web technology.
- Wachowicz, M, Bulens J, Rip, F (2002) GeoVR construction and use: The seven factors. Proceedings of the 5th AGILE. Palma
- Web3D Consortium (2004) <http://www.web3d.org/> (2004)
- Worboys, MF, Hearnshaw, HM, Maguire, DJ (1990) Object-oriented modelling for spatial databases. *Int. Journal of Geographic Information Systems (IJGIS)*. Vol. 4, No. 4, Taylor & Francis. London
- Würländer, R (1988) Untersuchung zur Integration von digitalen geländemodellen in raumbezogene informationssysteme. Diplomarbeit. Technische Universität München
- Youngman, C (1989) Spatial data structures for modeling subsurface features. In: Raper, JF (Ed.) *Three Dimensional Applications in Geographic Information Systems*. Taylor & Francis. pp. 129-136
- Zeitouni, K, Cambray, B de (1995) Topological modelling for 3D GIS. 4th. International Conference on Computers in Urban Planning and Urban Management. Melbourne, Australia, http://www.prism.uvsq.fr/public/beatrice/publi_en.html
- Zhu, C, Tan, EC, Chan, KY (2003) 3D Terrain visualization for Web GIS. Map Asia 2003, Kuala Lumpur, Malaysia, October 2003.
- Zlatanova, S (2000) 3D GIS for Urban Development. PhD Thesis. ITC Dissertation Series No. 69, The Netherlands
- Zlatanova, S, Abdul-Rahman, A, Shi, W (2004) Topological models and frameworks for 3D spatial objects. *Journal of Computers & Geosciences*. May, Vol 30, Issue 4, pp. 419-428
- Zlatanova, S, Abdul-Rahman A, Shi W (2002a) Topology for 3D spatial objects. International Symposium and Exhibition on Geoinformation (ISG). Kuala Lumpur, Malaysia
- Zlatanova, S, Abdul-Rahman A, Pilouk, M (2002b) 3D GIS: Current Status and Perspectives. Proc. of the Joint Conference on Geo-spatial theory, Processing and Applications. 8-12 July, Ottawa, Canada

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