Ken Arroyo Ohori

Curriculum vitae

Delft University of Technology
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Research interests

Much of my current research is about higher-dimensional (4D and higher) data models, data structures and algorithms for Geographic Information Systems, using these dimensions to model not only space, but also other characteristics such as time and scale. I am also interested in other topics that combine geometric/topological computing and spatial information, such as geometric modelling, the validation and repair of geographic data, topological data structures, and visualising spatial data. I like theoretical work, but what I enjoy most is implementing my ideas into working prototypes and, when they are serious enough, into free software.

Work

2016–now **Postdoc researcher**, *Delft University of Technology*, the Netherlands.

2011–2015 **PhD researcher**, *Delft University of Technology*, the Netherlands.

Education

2011–2016 **PhD**, *Delft University of Technology*, the Netherlands.
Title: *Higher-dimensional modelling of geographic information*

2008–2010 **MSc in Geomatics**, *Delft University of Technology*, the Netherlands.
Graduated with distinction
Thesis: *Validation and automatic repair of planar partitions using a constrained triangulation*

2003–2007 **BSc in Computer Science and Technology**, *Monterrey Institute of Technology and Higher Education, Mexico City Campus*, Mexico.
Minor in Software Engineering

Peer-reviewed publications

Note: PDFs are available at `https://3d.bk.tudelft.nl/ken/en/papers/`

2016 **Solving the horizontal conflation problem with a constrained Delaunay triangulation**. Hugo Ledoux and Ken Arroyo Ohori. *Journal of Geographical Systems*, 2016.

Defining simple nD operations based on prismatic nD objects. Ken Arroyo Ohori, Hugo Ledoux and Jantien Stoter. *Joint 3D Athens Conference 2016*, ISPRS Annals of the Photogrammetry, Remote Sensing and Spatial Information Sciences, ISPRS, Athens, Greece, October 2016.

What is a valid nD GIS object? extending the validity notions embedded in the geoinformation standards for 2D and 3D. Ken Arroyo Ohori, Hugo Ledoux and Jantien Stoter. *GeoAdvances 2016: ISPRS Workshop on Multi-dimensional & Multi-scale Spatial Data Modeling*, ISPRS Annals of the Photogrammetry, Remote Sensing and Spatial Information Sciences, ISPRS, Istanbul, Turkey, October 2016.

Population estimation using a 3D city model: a multi-scale country-wide study in the Netherlands. Filip Biljecki, Ken Arroyo Ohori, Hugo Ledoux, Ravi Peters and Jantien Stoter. *PLOS ONE* 11(6), June 2016.

Voxelization algorithms for geospatial applications. Pirouz Nourian, Romulo Gonçalves, Sisi Zlatanova, Ken Arroyo Ohori and Anh Vu Vo. *MethodsX* 3, January 2016.

2015 **Automatically enhancing CityGML LOD2 models with a corresponding indoor geometry**. Roeland Boeters, Ken Arroyo Ohori, Filip Biljecki and Sisi Zlatanova. *International Journal of Geographical Information Science* 29(12), December 2015, pp. 2248–2268.

Automatic semantic-preserving conversion between OBJ and CityGML. Filip Biljecki and Ken Arroyo Ohori. In F. Biljecki and V. Tourre (eds.), *Eurographics Workshop on Urban Data Modelling and Visualisation*, Eurographics Association, Delft, The Netherlands, November 2015, pp. 25–30.

Storing a 3D city model, its levels of detail and the correspondences between objects as a 4D combinatorial map. Ken Arroyo Ohori, Hugo Ledoux and Jantien Stoter. In Alias Abdul Rahman, Umit Isikdag and Francesc Antón Castro (eds.), Joint International Geoinformation Conference 2015, 28–30 October 2015, Kuala Lumpur, Malaysia, ISPRS Annals of the Photogrammetry, Remote Sensing and Spatial Information Sciences II–2/W2, ISPRS, Kuala Lumpur, Malaysia, October 2015, pp. 1–8.

Modelling a 3D city model and its levels of detail as a true 4D model. Ken Arroyo Ohori, Hugo Ledoux, Filip Biljecki and Jantien Stoter. *ISPRS International Journal of Geo-Information*, 4(3), September 2015, pp. 1055–1075.

A dimension-independent extrusion algorithm using generalised maps. Ken Arroyo Ohori, Hugo Ledoux and Jantien Stoter. *International Journal of Geographical Information Science* 29(7), July 2015, pp. 1166–1186.

An evaluation and classification of *n*D topological data structures for the representation of objects in a higher-dimensional GIS. Ken Arroyo Ohori, Hugo Ledoux and Jantien Stoter. *International Journal of Geographical Information Science* 29(5), May 2015, pp. 825–849.

2014 **A triangulation-based approach to automatically repair GIS polygons**. Hugo Ledoux, Ken Arroyo Ohori and Martijn Meijers. *Computers & Geosciences* 66, May 2014, pp. 121–131.

Constructing an *n*-dimensional cell complex from a soup of *(n-1)*-dimensional faces. Ken Arroyo Ohori, Guillaume Damiand and Hugo Ledoux. In Prosenjit Gupta and Christos Zaroliagis (eds.), *Applied Algorithms. First International Conference, ICAA 2014, Kolkata, India, January 13–15, 2014. Proceedings*, Lecture Notes in Computer Science 8321, Springer International Publishing Switzerland, Kolkata, India, January 2014, pp. 37–48.

2013 **Using extrusion to generate higher-dimensional GIS datasets**. Ken Arroyo Ohori and Hugo Ledoux. In Craig Knoblock, Peer Kröger, John Krumm, Markus Schneider and Peter Widmayer (eds.), *SIGSPATIAL'13: Proceedings of the 21st ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems*, ACM, Orlando, Florida, United States, November 2013, pp. 398–401.

Modelling higher dimensional data for GIS using generalised maps. Ken Arroyo Ohori, Hugo Ledoux and Jantien Stoter. In B. Murgante, S. Misra, M. Carlini, C. Torre, H. Q. Nguyen, D. Taniar, B. Apduhan and O. Gervasi (eds.), *Computational Science and Its Applications — ICCSA 2013. 13th International Conference, Ho Chi Minh City, Vietnam, June 24–27, 2013, Proceedings, Part I*, Lecture Notes in Computer Science 7971, Springer Berlin Heidelberg, June 2013, pp. 526–539.

Representing the dual of objects in a four-dimensional GIS. Ken Arroyo Ohori, Pawel Boguslawski and Hugo Ledoux. In A. Abdul Rahman, P. Boguslawski, C. Gold and M. N. Said (eds.), *Developments in Multidimensional Spatial Data Models*, Lecture Notes in Geoinformation and Cartography, Springer Berlin Heidelberg, Johor Bahru, Malaysia, May 2013, pp. 17–31.

Manipulating higher dimensional spatial information. Ken Arroyo Ohori, Filip Biljecki, Jantien Stoter and Hugo Ledoux. In Danny Vandenbroucke, Bénédicte Bucher and Joep Crompvoets (eds.), *Geographic Information Science at the Heart of Europe. Proceedings of the 16th AGILE International Conference on Geographic Information Science*, Leuven, Belgium, May 2013.

2012 **Validation and automatic repair of planar partitions using a constrained triangulation**. Ken Arroyo Ohori, Hugo Ledoux and Martijn Meijers. *Photogrammetrie, Fernerkundung, Geoinformation* 5, October 2012, pp. 613–630.

Automatically repairing polygons and planar partitions with *prepair* and *pprepair*. Ken Arroyo Ohori, Hugo Ledoux and Martijn Meijers. *Proceedings of the 4th Open Source GIS UK Conference*, Nottingham, United Kingdom, September 2012.

Integrating scale and space in 3D city models. Jantien Stoter, Hugo Ledoux, Martijn Meijers and Ken Arroyo Ohori. In Jacynthe Pouliot, Sylvie Daniel, Frédéric Hubert and Alborz Zamyadi (eds.), *Proceedings of the 7th International 3D GeoInfo Conference, International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences* XXXVIII–4/C26, ISPRS, Québec City, Canada, May 2012, pp. 7–10.

Automatically repairing invalid polygons with a constrained triangulation. Hugo Ledoux, Ken Arroyo Ohori and Martijn Meijers. In Jérôme Gensel, Didier Josselin and Danny Vandenbroucke (eds.), *Multidisciplinary Research on Geographical Information in Europe and Beyond. Proceedings of the 15th AGILE International Conference on Geographic Information Science*, Avignon, France, April 2012, pp. 13–18.

2011 **Edge-matching polygons with a constrained triangulation**. Hugo Ledoux and Ken Arroyo Ohori. *Proceedings of GIS Ostrava 2011*, Ostrava, Czech Republic, January 2011, pp. 377–390.

Supervised thesis

2013 **Automatic enhancement of CityGML LoD2 models with interiors and its usability for net internal area determination**. Roeland Boeters. Master's thesis, Delft University of Technology, June 2013.

Full courses lectured

2014 **GEO1002 Geographical Information Systems and Cartography** (2014–2015 Q1)

2013 **GEO1002 Geographical Information Systems and Cartography** (2013–2014 Q1)

Open source software

2015–now **imbiber**, create nicely formatted HTML from BibTeX files directly from Jekyll.

2014–now **lcc-tools**, tools to construct and manipulate higher-dimensional linear cell complexes.

2010–now **pprepair**, (planar partition repair) ensures that a set of polygons form a valid planar partition, made of valid polygons and having no gaps or overlaps.

2010–now **prepair**, (polygon repair) takes a possibly invalid polygon, gives it a consistent interpretation and returns a valid polygon according to the OGC Simple Features and ISO 19107 rules.

Editorial board in journals

International Journal of 3D Information Modeling

Scientific committee member in conferences

2016 **4th Eurographics Workshop on Urban Data Modelling and Visualisation**. Liège, Belgium.

11th 3D Geoinfo Conference. Athens, Greece.

2nd International Conference in 3D Indoor Modelling and Navigation. Athens, Greece.

2015 **WITCOM 2015, Conferences and Workshops in Telematics and Computing**. Mexico City, Mexico.

3rd Eurographics Workshop on Urban Data Modelling and Visualisation. Delft, the Netherlands.

2014 **1st International Congress on Telematics, Computing and Communications**. Mexico City, Mexico.

Reviews in journals

ISPRS International Journal of Geo-Information (2016)

Journal of Geographical Systems (2016)

International Journal of Geographical Information Science (2015, 2016)

International Journal of 3D Information Modeling (2014)

Transactions in GIS (2013, 2014, 2015, 2016)

Computers & Geosciences (2012, 2013, 2014, 2015, 2016)

Skills

Computer-related

Operating Systems: Familiar with all recent versions of Windows, Mac OS and various Linux distributions. Others as a user, but with little programming experience.

Programming: Familiar with C, C++, CSS, HTML, Objective-C, PHP, Python and Ruby. Others in a lesser degree (e.g. Java, Javascript, Lisp, Matlab, Scheme, Perl, Prolog). Use of other relevant software, libraries and frameworks for computational geometry (e.g. CGAL, openCASCADE), graphics and visualisation (e.g. OpenGL), debugging and unit testing, parsing, I/O in various file formats, and user interfaces, among others.

Software: Various office suites (e.g. iWork, MS Office and OpenOffice.org), databases (e.g. MySQL, Oracle and PostgreSQL) with spatial extensions, web servers (Apache and nginx), typesetting with (Xe)LaTeX, image editing packages and drawing programs (e.g. Aperture, OmniGraffle and Adobe Photoshop), among others.

Languages

Spanish: native speaker

English	expert (IELTS 8.5 and paper based TOEFL 670)
Japanese	intermediate (3-kyu)
Dutch	basic
French	very basic
German	very basic

References

Available upon request