Taller: Avances en teoria y practica Cartografica y en informacion geoespacial

10-14 deciembre 2018

INEGI, Aguascalientes, Mexico

Instructor: Nicholas Chrisman, PhD

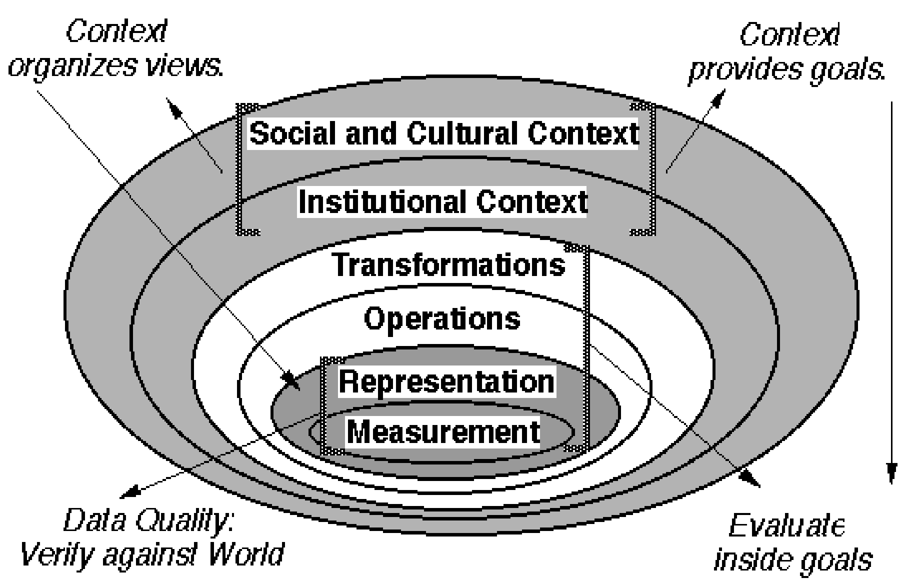
Temas principales (5)

1. Aspectos de cartografia moderna
2. Estructuras de datos topologicas
3. Aseguramiento de cualidad de la informacion geoespacial
4. Valor publico agregado de los servicios y soluciones geoespaciales
5. Alianzas estrategicas y construccion de redes y communidades de practica en la materia

   Otros themas (adaptados a INEGI)

Cada tema se pone sus materias y referencias bibiliograficas, paginas sequentias (en ingles)

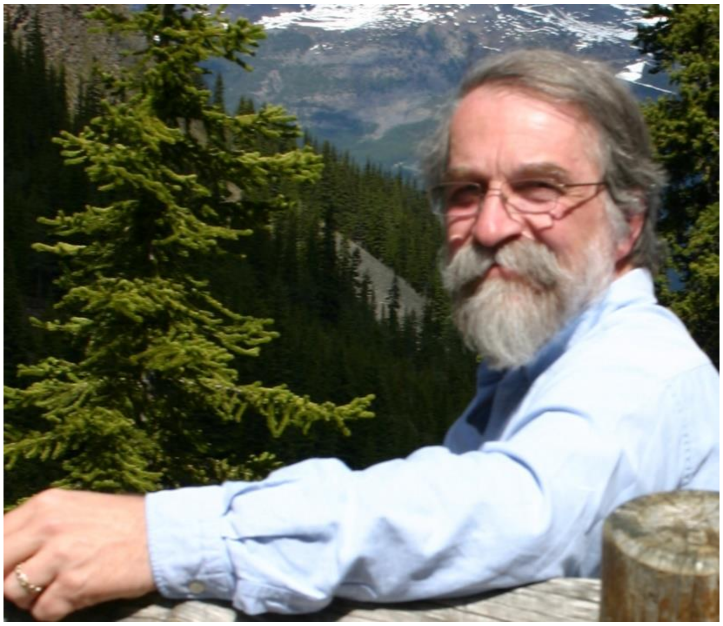
Each theme is described below on a separate page with materials and references attached (details in English). The overall setting is provided in the diagram from Exploring Geographic Information Systems (2001), John Wiley Publishers.



Chrisman, N.R., 2001: Exploring Geographic Information Systems. Wiley. 270 pp.

But first, who is Nick Chrisman?

Nicholas Chrisman is currently Editor of the journal Cartography and Geographic Information Science, based in Bellingham, Washington. For 2013-2014, he was Professor of Geospatial Science and Discipline Head at RMIT University in Melbourne, Australia. From 2005 to 2012, he was Professor of Geomatics Sciences at the Université Laval, Canada with his principal assignment as Scientific Director of the GEOIDE Network. His research has concentrated on time in GIS, data quality testing and the social and institutional aspects of Geographic Information Systems. From 1987-2004 he was Professor of Geography at University of Washington. From 1982-87 he was Assistant Professor in the Department of Landscape Architecture at the University of Wisconsin-Madison. During the 1980s, he was in charge of the Working Group on Spatial Data Quality of the National Committee for Cartographic Data Transfer Standards. From 1972-82 he was a programmer at the Harvard Lab for Computer Graphics. He participated in the design of prototype GIS software. His PhD is from the University of Bristol (UK) for research on error and statistics applied to categorical maps. For many decades, his writing has tried to connect the technical details of GIS to larger issues of philosophy and culture.



Aspects of Modern Cartography

State of the field:

- All cartography is digital and most digital data is geospatially referenced. Cartography is a core item in digital media
- Cartographers require training in many elements of the digital economy
- GIS makes maps; maps make GIS. Cartographers have to understand GIS. GIS users need to recognize that cartography is an 'art and science'- lots to learn.
- The big revolution was not 'digital', but putting the user (map-reader) as the key player, not just throwing 'goodie over the fence'

Geospatial data consists of what we have managed to measure, inside our constraints (budget, equipment, people), but particularly our constraints in terms of how we represent our measurements. Users often want/need what we didn't (can't) measure. They must then TRANSFORM the data through a series of assumptions and processing logic. This has been the bedrock of GIS since the 1960s, and 'machine learning' is just another tool in this long-term engagement.

Australian report (CRCSI, 2018) lists the elements of the 'fourth industrial revolution': mobile devices, cloud computing, augmented reality and wearable technologies, multilevel customer interaction and profiling, big data analytics and advanced algorithms, smart sensors, 3D printing, authentication and fraud detection, advanced human-machine interfaces, Internet of Things platforms, block chains, drones, robots, and location-detection technologies.

1986: Peter Burrough – 5 Reasons why GIS is not used effectively…

1. uncertainty and fuzziness in resource data
2. reliance on sample points for assessment
3. GIS inaccessible due to cost
4. lack of training and workforce
5. remote sensing has diverted attention from 'more direct methods of land resource assessment'

2013 paper: Progress and Missed Opportunities in Spatial Analysis for Digital Earth
Abstract— The development of spatial data technologies has been spotty, with certain topics getting much more attention than others. This paper returns to an assessment of limitations written in 1986 by Professor Peter Burrough and finds a few of his observations that remain important. More recent calls for Digital Earth are reconsidered in terms of spatial analysis capabilities.

Resources & Readings (Theme #1)

Presentation: Challenges in the geospatial sector (given at ITC 2014)

Coppa, I., Woodgate, P. W., and Mohamed-Ghouse Z.S. (2018), 'Global Outlook 2018: Spatial Information Industry'. Published by the Australia and New Zealand Cooperative Research Centre for Spatial Information (Creative-Commons, document provided)

Thomas Blaschke & Helena Merschdorf (2014) Geographic information science as a multidisciplinary and multiparadigmatic field, Cartography and Geographic Information Science, 41:3, 196-213, DOI: 10.1080/15230406.2014.905755

Chrisman N.R. 2013: Progress and Missed Opportunities in Spatial Analysis for Digital Earth, IGARSS 2013, Melbourne, p. 1163-1165. DOI: 10.1109/IGARSS.2013.6721372

Chrisman, N.R. 2017: Calculating on a round planet. International Journal of Geographic Information Science. 31(4) 637-657. doi:10.1080/13658816.2016.1215466

Chrisman, N.R. 1999: A Transformational Approach to GIS operations, International Journal of GIS 13(7) 617-637.

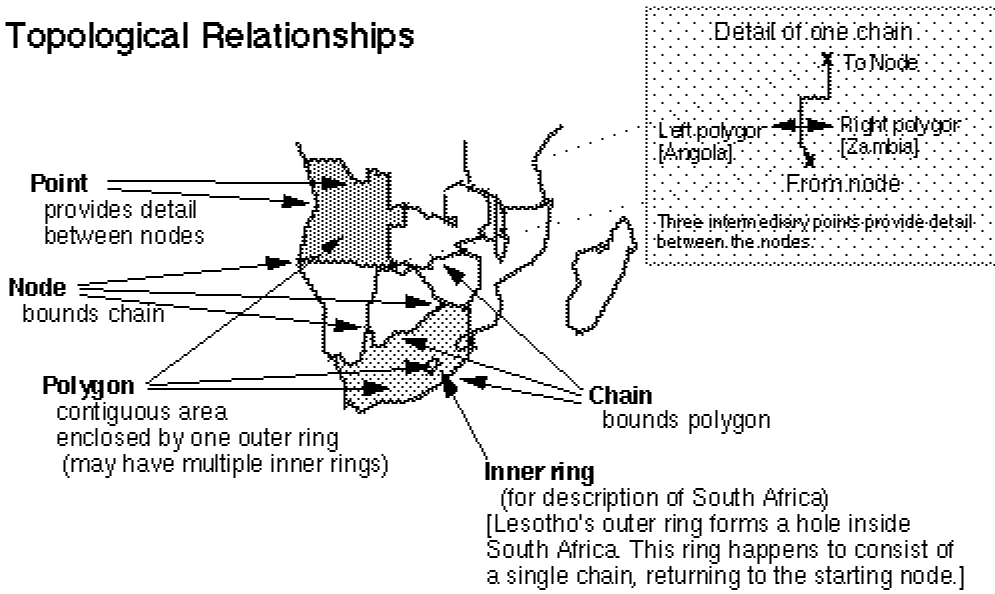
2012: Transformaciones cartograficas (version espanol)

Chrisman, N.R. 1999 What does GIS mean? Transactions in GIS 3(2) 175-186.

Chrisman, N.R., 2001: Exploring Geographic Information Systems. Wiley. 270 pp.

Topological Data Structures

A longer issue in GIS and cartography- capturing the fundamental spatial relationships
Connectivity- connectedness
Containment - Boundary (recursively)



Resources:

Peucker, T.K. and Chrisman, N.R., 1975: Cartographic data structures, American Cartographer, 2:55-69.

Vector Product Format (a standard for geospatial data) – NATO/US Military (developed for Digital Chart of the World project) MIL-STD-2407

.. /G458/lec15.html

.. /G460/Lec06.html

Ensuring spatial data quality

- What can be checked?
- Have you checked it?
- Have you fixed it? (and why not…)?

Elements of Data Quality
(date back to work for National Standards for US 1980s)
Now ISO / OGC

5 Basic components

- Lineage
- Positional Accuracy
- Attribute Accuracy
- Logical Consistency
- Completeness

(Temporal Accuracy, also an issue but often not separately testable).

Issues: metadata is a fine idea, but useless if the fields are all blank.
Resources required (time, expertise, etc.) to ensure quality.
Data quality varies spatially; to record data quality for a map, you need a map (a meta-map?)

Resources/ bibliography
ISO standard
VMAP standard (coverages for data quality)
Chrisman AUTO-CARTO 6
Chrisman data quality chapter in Big Book

Devillers, R, Stein, A, Bédard, Y, Chrisman, N, Fisher, P, Shi, W. 2010: 30 years of research on spatial data quality – Achievements, failure and opportunities. Transactions in GIS 14 (4) 387-400, doi: 10.1111/j.1467-9671.2010.01224.
Chrisman, N.R. 2005 : Chapter 1 Development in the treatment of spatial data quality, p. 21-30 in Devillers, R. & Jeansoulin, R. (eds.) Fundamentals of Spatial Data Quality, p. 21-30, Chapter.
Chrisman, N.R., 1991: The error component in spatial data, Chapter 12, p. 165-174 in Maguire, D.J., Goodchild M.F. and Rhind, D.W. (editors) Geographical Information Systems: Overview Principles and Applications, Longmans
Chrisman, N.R., 1983: The role of quality information in the long-term functioning of a geographic information system, Proceedings AUTO–CARTO 6, 2:303-321; reprinted 1984: Cartographica, 21 (2&3):79-87. https://cartogis.org/docs/proceedings/archive/auto-carto-6/pdf/the-role-of-quality-information-in-the-long-term-functioning.pdf
.. /G460/Lec17.html
Web pages of Geog 458, (past course online) www.nchrisman.fastmail.fm/Geog_458.html

Value-added

What does geospatial information add to the economy and to general public good?

Much more than we ever dreamed!

Spatial requirements cross many sectors, common resources can be shared:
GPS (built for military, now omnipresent)
Location-based services / location dependent information
Internet of Things (more IP addresses for objects, tracking, coordination.)

Bottom line: geospatial contributes value to a major portion of the economy. It was probably always true, just much more evident now. How many billion is not so important.

Resources:

Coppa, I., Woodgate, P. W., and Mohamed-Ghouse Z.S. (2018), 'Global Outlook 2018: Spatial Information Industry'. Published by the Australia and New Zealand Cooperative Research Centre for Spatial Information (Creative-Commons, document provided)

Sensor presentation (2011, ppt/pdf)

A view from 2003 (15 years ago…) .. /G460/res26.html

Building Networks and Communities of Practice

Success will be shared among those who collaborate.
Much to do, value comes from sharing solutions and data.

"With sufficient eyeballs, all bugs are trivial." (Cathedral versus Bazaar)

Resources:

Chrisman, N.R. and Thomson, K.B.T. 2012: A short history of the GEOIDE Network. In The Added Value of Scientific Networking: Perspectives from GEOIDE Network Members 1998-2012, editors: N. Chrisman and M. Wachowicz, ISBN 978-1-927371-68-8, p. 1-30.

Chrisman, N.R. 2007: Living inside networks of knowledge, ArcNews, Fall. Reprinted in Getis, A. ed. (2008) Essays on Geography and GIS, volume 1, ESRI Press, 25-35.

Poore, Barbara and Chrisman, N.R. 2006: Order from Noise: Towards a social theory of information, Annals AAG 96(3) 508–523