Frank Hardisty

The GeoVISTA Center
Department of Geography
and
John A. Dutton e-Education Institute
College of Earth and Mineral Science

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A. Educational Qualifications.

Ph.D., Geography The Pennsylvania State University, University Park, PA 16802
1999 – 2003 *Dissertation:* Strategies For Designing Coordinated Geographic Visualization Software For Enumerated Data: A Component-Based Approach
Doctoral committee: Alan MacEachren (advisor and chair), Mark Gahegan, David O'Sullivan, Gouray Cai (Information Science and Technology)

M.A., Geography The Ohio State University, Columbus OH 43210
1997-1999 *Thesis:* Visualizing Monte Carlo Simulation of Univariate Spatial Point Patterns
Master's committee: Duane Marble (advisor and chair), Morton O'Kelly, Randall Jackson

B.A., English Lit. The Evergreen State College Olympia, WA 98505
1985-1990 *Concentrations:* English Literature and Mathematics

B. Publications

Peer-Reviewed Journal Publications

Klippel, A., F. Hardisty and R. Li (Under Review). "Interpreting Spatial Patterns - An Inquiry into Formal and Cognitive Aspects of Tobler's First Law of Geography " Annals of the Association of American Geographers.

Hardisty, F. and A. Robinson (Accepted). "The GeoViz Toolkit: Using component-oriented coordination methods to aid geovisualization application construction." International Journal of Geographic Information Science.

Hardisty, F. (2009). "GeoJabber: Enabling Geo-Collaborative Visual Analysis." Cartography and Geographic Information Science **36**(2): 267-280.

Klippel, A., F. Hardisty and C. Weaver (2009). "Star Plots: How Shape Characteristics Influence Classification Tasks " Cartographic and Geographic Information Science **36**(2): 149-163.

Klippel, A., F. Hardisty and C. Weaver (2009). "Colour Enhanced Star Plot Glyphs – Can Salient Shape Characteristics be Overcome?" Cartographica **44**(3): 217-231.

Gorandson, C., K. Takahashi, T. Tango, A. Cajigal, M. Paladini, E. L. Murray, T. Nguyen, K. Konty and F. Hardisty (2008). "Cluster Detection Comparison in Syndromic Surveillance." Advances in Disease Surveillance **5**(1): 33.

Hardisty, F. and J. Conley (2008). "Interactive Detection of Spatial Clusters." Advances in Disease Surveillance **5**(1): 37.

Piegorsch, W. W., S. L. Cutter and F. Hardisty (2007). "Benchmark Analysis for Quantifying Urban Vulnerability to Terrorist Incidents." Risk Analysis **27**(5): 1141-1425.

Griffin, A., M. A. MacEachren, F. Hardisty, B. Li and E. Steiner (2006). "A comparison of animated maps with static small-multiple maps for visually identifying space-time clusters." Annals of the Association of American Geographers **4**(4): 740-753.

MacEachren, A. M., M. Gahegan, W. Pike, I. Brewer, G. R. Cai, E. Lengerich and F. Hardisty (2004). "Geovisualization for knowledge construction and decision support." IEEE Computer Graphics and Applications **24**(1): 13-17.

MacEachren, A. M., F. Hardisty, X. Dai and L. Pickle (2003). "Supporting Visual Analysis of Federal Geospatial Statistics." Communications of the ACM **46**(1).

Gahegan, M., M. Takatsuka, M. Wheeler and F. Hardisty (2002). "Introducing GeoVISTA Studio: an integrated suite of visualization and computational methods for exploration and knowledge construction in geography." Computers, Environment and Urban Systems **26**(4): 267-292.

Other Refereed Publications

Gahegan, M., F. Hardisty, U. Demšar and M. Takatsuka (2008). GeoVISTA *Studio*: Reusability by Design. Open Source Approaches in Spatial Data Handling. G. B. Hall and M. G. Leahy, Springer**:** 201-220.

Robinson, A., E. Koua, F. Hardisty and A. M. MacEachren (2007). The G-EX Portal: Web-based Dissemination of Geovisual Analytic Results. ICA Commission on Visualization and Virtual Environments Workshop 'From Geovisualization Toward Geovisual Analytics'. Helsiki, Finland).

Dai, X. and F. Hardisty (2002). Conditioned and Manipulable Matrix for Visual Exploration. National Conference for Digital Government Research, Los Angeles, CA

Hardisty, F., A. M. MacEachren and M. Takatsuka (2002). Cartographic Animation in Three Dimensions: Experimenting with the Scene Graph. 20th International Cartographic Conference, Beijing, China

Haug, D., A. M. MacEachren and F. Hardisty (2002). The challenge of analyzing geovisualization tool use: Taking a visual approach. 20th International Cartographic Conference, Beijing, China

MacEachren, A. M., F. Hardisty, M. Wheeler, M. Gahegan, X. Dai, D. Guo and M. Takatsuka (2002). Supporting visual integration and analysis of geospatially-referenced statistics through web-deployable, cross-platform tools. 20th International Cartographic Conference, Beijing, China

MacEachren, A. M., F. Hardisty, M. Gahegan, M. Wheeler, X. Dai, D. Guo and M. Takatsuka (2001). Supporting visual integration and analysis of geospatially-referenced statistics through web-deployable, cross-platform tools. dg.o.2001, National Conference for Digital Government Research, Los Angeles, CA

Other Publications

Hardisty, F. (2008). GeoJabber: Finding Significant Analytic Events in Collaborative Visual Analysis Sessions. Geospatial Visual Analytics Workshop at GIScience, Salt Lake City, Utah (Refereed Abstract).

Hardisty, F. (2005). The GeoViz Toolkit: User-centered run-time coordination of geographic visualization components. Auto-Carto, Las Vegas, NV (Refereed Abstract).

Gahegan, M., M. Takatsuka, M. Wheeler and F. Hardisty (2000). GeoVISTA Studio: a geocomputational workbench. GeoComputation, UK (Refereed Abstract).

Hardisty, F. (1999). Stochastic Modeling of Alternate Methods for the Generation of Event Patterns with Complete Spatial Randomness. GeoComputation 99. Fredericksburg, VA.

Presentations

Hardisty, F. (2010). Using text analytics with spatial statistics to characterize H1N1 flu outbreaks. The 106th Annual Meeting of the Association of American Geographers. Washington, DC.

Hardisty, F. (2010). Interactive Syndromic Surveillance of Influenza Rates using the GeoViz Toolkit. Analysis, Visualization and Reporting (AVR) Webinar CDC.

Hardisty, F. and A. Klippel (2010). Analysing Spatio-Temporal Autocorrelation with LISTA-Viz. GeoVA(t) - Geospatial Visual Analytics: Focus on Time. Guimarães, Portugal, ICA Commission on GeoVisualization.

Luo, W., J. Blanford, F. Hardisty, C. McCabe and A. M. MacEachren (2010). A hierarchical framework to understand the characteristics of measles transmission. The 106th Annual Meeting of the Association of American Geographers. Washington, DC.

Hardisty, F. (2009). The GeoViz Toolkit for Disease Surveillance. Data Visualization for Health Surveillance: Current Concepts and New Horizons, Webinar, International Society for Disease Surveillance (Invited Panel Discussion).

Hardisty, F. (2009). The GeoViz Toolkit: An easy-to-use approach to ESDA. URISA Public Health, Providence, RI (Invited Plenary Presentation).

Hardisty, F. (2009). GeoViz Toolkit Tutorial. Workshop at URISA Public Health. Providence, RI.

Hardisty, F. and A. MacEachren (2009). Research to Reality: Supporting Public Health Research, Surveillance, and Practice with Geovisual Analytics The Third Annual DHS University Network Summit. Washington, D.C.

MacEachren, A. M., F. Hardisty and M. Stryker (2009). GeoVISTA Center Exploratory Geovisualization & Visual Analytics Research & Development Tenth NX Workshop. Pennsylvania State University, State College, PA, NATO Research and Technology Organization Research Study Group IST-85.

Hardisty, F. (2008). Geographic Visualization and Analysis. CRED Lab (invited talk), NYC, NY

Hardisty, F. (2008). The GeoViz Toolkit: Making Geographic Visualization Accessible. Washington URISA GIS Conference. Bellevue, WA.

Hardisty, F. and J. Conley (2008). Interactive Detection of Spatial Clusters. International Society for Disease Surveillance. Raleigh, NC.

Klippel, A. and F. Hardisty (2008). Visual Analytics and the Geometry of Thought—Spatial Intelligence through Sapient Interfaces. Research and Training in Spatial Intelligence, Evanston, IL (Refereed Abstract).

Robinson, A. and F. Hardisty (2008). Highlighting Methods for Geovisualization. North American Carographic Information Society, Missoula, MT (Refereed Abstract).

Hardisty, F. (2007). ESDA for Prostate Cancer. Invited Talk. Hershey, PA.

Hardisty, F. (2006). Using Cartograms for Geovisualization. Association of American Geographers Annual Meeting, Chicago (Published Abstract).

Hardisty, F. (2006). Digital Government -- The Geographic Dimension. Lecture Series on Digital Government. Olympia, WA.

Li, L. and F. Hardisty (2006). Web Based Synchronous Geocollaboration. Annual Meeting of the AAG, Chicago, Il (Published Abstract).

Hardisty, F. (2005). Combining the GeoViz Toolkit with Infovis Methods. AAG, Denver, CO (Published Abstract).

Liao, K. and F. Hardisty (2005). Visualization of Long-term Temporal Data. AAG, Denver, CO (Published Abstract).

Macgill, J., M. Gahegan, J. Conley and F. Hardisty (2005). Aplying GeoVISTA Studio for the spatial analysis of prostate cancer. AAG, Denver, CO (Published Abstract).

Hardisty, F. (2004). Coordinating Geographic Visualization and Spatial Statistics. Meeting of ICA Comission on Geovisualization at GIScience, University of Maryland

Hardisty, F. (2004). Open Source Cartography. NACIS, Portland, Maine

Zhou, B., C. Brewer and F. Hardisty (2003). ColorBrewer in GeoVISTA Studio: Construction and application of bivariate color schemes Joint Statistical Meetings - Section on Statistical Graphics, San Francisco, CA (CD-ROM).

Hardisty, F. (2002). Designing and Building Usable Geovisualization Tools. EuroConference on Methods to Define Geovisualisation Contents for Users Needs, Albufeira, Portugal

Hardisty, F. (2001). Applying Usability Engineering to Visualization Software Design Problems. 97th Annual Meeting of the Association of American Geographers, New York, NY (Published Abstract).

Hardisty, F. (2000). An Example of an Interactive Animated Map. AAG Annual Meeting, Pittsburgh, PA (Published Abstract).

Hardisty, F. (1999). Animated Maps and Cartographic Communication. Association of American Geographers Annual Meeting, Honolulu, HI (Published Abstract).

C. Positions and Honors.

Positions and Employment

2007-Present Research Associate and Instructor, The Pennsylvania State University
2003-2006 Assistant Professor, University of South Carolina
1999-2003 Academic Computing Fellow, Research Assistant, Instructor at the Pennsylvania State University
1997-1999 Research and Teaching Assistant at the Ohio State University
1996-1997 Instructor, International Education Center, Honam University, South Korea

Honors

2010 Wilson Travel Grant from Penn State's College of Earth and Mineral Science to present "Analysing Spatio-Temporal Autocorrelation with LISTA-Viz" at the "GeoVA(t) - Geospatial Visual Analytics: Focus on Time" workshop.

2009 Gladys Snyder Education Grant (with Alex Klippel) "Spatial Analysis Podcasts (SAP):Tailoring Teaching and Training through Knowledge Nuggets."

August 2000 – August 2003
Academic Computing Fellowship from Penn State

September 1999 – August 2001
Bunton-Waller Graduate Award from Penn State

GIScience 2000 ESRI Scholarship

September 1999 – August 2000
University Graduate Fellowship from Penn State.

D. Research Support

Ongoing Research Support

Contextual influences on the category construction of geographic-scale

movement patterns (ConCat)
National Science Foundation
(role: Senior Scientist)
64RN-42412 Alex Klippel (PI)
9/1/ 2009-12/31/2010 Award Amount: $93,217

The ConCat project addresses the question of how movement patterns at the geographic scale are understood by humans (e.g., the paths of hurricanes) and how this understanding relates to qualitative spatio-temporal formalism.

Visual Analytics for Command, Control, and Interoperability Environments
Department of Homeland Security
(role: Senior Scientist)
2009-ST-061-CI0001 David Ebert (PI)
4/1/2009-6/30/2015 Award Amount $15,000,000

The amount of information gather during a crisis can be crushing if not managed correctly. DHS views this new Center's research and education in visualization as critical to the protection and security of America and her allies. In the event of a catastrophe such as a chemical spill, natural disaster, disease outbreak or a terrorist attack, information will be coming from many sources, such as camera images, data from sensors and simulations, and text documents from police and health-care agencies. VACCINE will focus on education, research, development, and deployment of interactive visual analytic environments for communicating and disseminating information and deriving insight from the massive homeland security data deluge.

Vaccine Modeling Initiative (VMI)
Gates Foundation
(role: Senior Scientist)
49279 Donald Burke (PI)
4/1/2008 - 3/31/2012 Award Amount $10,122,392

The goal of this project is to develop and deploy computational models and simulations of infectious disease transmission dynamics and vaccine logistics, to be used in support of the new vaccine technologies programs of the BMGF "Grand Challenges" and in support of WHO Communicable Disease Control efforts more broadly.

<u>Completed Research Support</u>

Geovisualization and Spatial Analysis of Cancer Data
National Institutes of Health / National Cancer Institute
(role: Research Assistant, Senior Scientist)
R01 CA95949-01 Alan M. MacEachren (PI)

4/1/ 2002-3/31/2009 Award Amount: $1,365,568

The goal of this research has been to develop, implement and assess an integrated suite of cross-platform visual-statistical-computational, methods and tools that enable geovisualization and exploratory spatial data analysis to support public health research and policy directed to cancer etiology, surveillance, and control.

Knowledge-enabled Visual Analytics: Supporting individuals and teams from analysis through action

Pacific Northwest National Laboratory/Department of Homeland Security

(role: Senior Scientist)

Subcontract 22193 Alan M. MacEachren (PI)

1/3/2006-6/30/2009 Award Amount: $1,727,888

This grant funds a regional center that coordinates with the National Center for Visualization and Analytics at PNNL and four other regional centers to develop, implement, test, and deploy visual analytic methods to support analytical reasoning with complex data in domains relevant to Homeland Security (e.g., infectious disease, crisis management, and threat assessment).

Geovisual EXplication Portal – Supplement to Geovisualization and Spatial Analysis of Cancer Data

National Institutes of Health / National Cancer Institute

(role: Senior Scientist)

Supplement to: R01 CA95949-01 Alan M. MacEachren (PI) 9/1/2006-3/30/2009 Award Amount: $200,000

This supplement to the *Geovisualization and Spatial Analysis of Cancer Data* grant (listed above) is focused on developing and assessing a web-based strategy for enhanced explication and dissemination of the surveillance research methods and tools developed and of the surveillance research that they enable.

Improving Geographic Visualization for Data Analysis

South Carolina Army National Guard

13540-04-1087

(role: PI) Frank Hardisty (PI)

1/1/ 2005-6/1/2006 Award Amount: $50,000

This grant funded the development of star-plot maps, a means of doing multivariate geographic data visualization. It also funded continued development of the GeoViz Toolkit, including inclusion of a HTML help system, and the first version of re-loadable designs.

N00140510629 (role: Co-PI)

National Consortium for the Study of Terrorism and the Responses to Terrorism

Department of Homeland Security
(role: Senior Scientist) Gary LaFree (PI)
6/1/ 2005-12/31/2006

The National Consortium for the Study of Terrorism and Responses to Terror (START) is a U.S. Department of Homeland Security Center of Excellence, tasked by the Department of Homeland Security's Science and Technology Directorate with using state-of-the-art theories, methods, and data from the social and behavioral sciences to improve understanding of the origins, dynamics, and social and psychological impacts of terrorism.

E. Graduate Courses Taught

At the University of South Carolina:
GEOG 541: Advanced Cartography
GEOG 731: Seminar on Quantitative Analysis in Geography
GEOG 741: Seminar on Geographic Visualization

At the Pennsylvania State University
GEOG 485: GIS Programming and Customization
GEOG 586: Geographic Information Analysis

F. Master's Students Supervised

Chris Saylor, June 2005
Linna Li, June 2006
Chris Goranson, June 2009
Jon Jones, June 2009
Andrew Parker, June 2009
Allen Cousins, December 2009
Michelle Ballinger, Projected Graduation September 2010
Quaye Trimble, Projected Graduation December 2010
Mike Team, Projected Graduation December 2010
Jimmy Kroon, Projected Graduation December 2010
Desmond Carroll, Projected Graduation June 2011

G. Technical Skills

Programming Languages:	Expert in Java 1.1 to 1.6, Visual Basic 4.0 to 6.0, Some experience in R, C#, VB.Net, Python and Jython, Pascal, Lisp, Prolog, and Logo.
Programming Methodologies:	Software Patterns (GoF), Component-Based Development, Unit Testing, Scripting, Proving Programs Correct

Java Technologies:	UML, XML, Eclipse, Ant, Maven, JNI (Java Native Interface), Tomcat, GeoTools, JDom, Hudson, JDBC, RMI (Remote Method Invocation), Colt, JTS (Java Topology Suite), Servlets
Mathematical Expertise:	Multivariate Statistics, Spatial Statistics, Decision Trees, Neural Networks, Computational Geometry, Non-Euclidean Geometry

H. Recent Collaborators & Other Affiliations

Alan MacEachren (Pennsylvania State University), Alex Klippel (Pennsylvania State University), Anthony Robinson (Pennsylvania State University), Jamison Conley (West Virginia University), Jeremy Mennis (Temple University), Linna Li (University of California at Santa Barbara), Diansheng Guo (University of South Carolina), Sara Fabrikant (University of Zurich), Duane Marble (Ohio State University)