

Evolutionary Visual Software Analytics - Presentation

Antonio González Torres

Departamento de Informática y Automática de la Universidad de Salamanca
agtorres@gmail.com

This is the presentation of the Ph.D Dissertation defense event that was held at the University of Salamanca on May 21st.

The development and maintenance of software systems involve a large number of complex processes (that could be extended for long periods of time) and people (e.g., programmers and project managers) who may be located in different countries. Therefore, people involved in these processes require tools to understand the systems, their components and the relationships established between these in time.

Understanding systems becomes particularly relevant when taking into account staff turnover in organizations and the frequent absence of technical system documentation. Therefore, a detailed study on the needs of programmers and project managers, a systematic mapping study, a detailed literature review and a survey on the use of visualization tools in the software industry and IT departments for system understanding were carried out in this thesis. Based on the results of the above activities, the definition and description on the application of Visual Analytics to Software Evolution (which was called Evolutionary Visual Software Analytics) was performed.

The validation of this process was conducted in three stages. In the first stage, an architecture was designed to verify that by following the Evolutionary Visual Software Analytics process description it is possible to design Visual Analytics tools to facilitate the understanding of the evolution of software systems. In the second stage, the architecture was validated by implementing Maleku (a tool based on this architecture). In the third stage, the usefulness and usability of Maleku in understanding the evolution of software systems was verified through various use cases, an usability study and a case study.

The final results of this study allowed us to prove that the application of Visual Analytics to Software Evolution, using the process described in this research, can contribute to software development and maintenance to facilitate the understanding of systems, and therefore the research questions of this thesis were answered and the specified objectives were met.

Keywords

Evolutionary Visual Software Analytics, Visual Analytics, Software Visualization, Software Evolution, Software Evolution Analysis, Software Maintenance.

Ph.D. Dissertation

<http://repositorio.grial.eu/handle/grial/405>

Presentation

<http://www.slideshare.net/grialusal/evolutionary-visual-software-analytics>

References

- [2015] *JFreeChart*. <http://www.jfree.org/index.html/>, 2015. [Online; accessed 28-March-2012]. 259
- [Abuthawabeh 2013] Ala Abuthawabeh, Fabian Beck, Dirk Zeckzer and Stephan Diehl. *Finding structures in multi-type code couplings with node-link and matrix visualizations*. In First IEEE Working Conference on Software Visualization (VISSOFT), 2013, pages 1–10, 2013. 122, 123, 144, 306
- [Academies 2000] The National Academies. *How people learn: brain, mind, experience, and school*. National Academy Press, 2000. 203
- [Adamoli 2010] Andrea Adamoli and Matthias Hauswirth. *Trevis: a context tree visualization analysis framework and its use for classifying performance failure reports*. In Proceedings of the 5th international symposium on Software visualization, SOFTVIS '10, pages 73–82, New York, NY, USA, 2010. ACM. 305
- [Aftandilian 2010] Edward E. Aftandilian, Sean Kelley, Connor Gramazio, Nathan Ricci, Sara L. Su and Samuel Z. Guyer. *Heapviz: interactive heap visualization for program understanding and debugging*. In Proceedings of the 5th international symposium on Software visualization, SOFTVIS '10, pages 53–62, New York, NY, USA, 2010. ACM. 305
- [Agerfalk 2006] Pär J. Agerfalk and Brian Fitzgerald. *Flexible and Distributed Software Processes: Old Petunias in New Bowls?* Communications of the ACM, vol. 49, no. 10, pages 26–34, October 2006. 147, 150
- [Aggarwal 2005] K.K. Aggarwal, Yogesh Singh, Pravin Chandra and Manimala Puri. *Measurement of Software Maintainability Using a Fuzzy Model*. Journal of Computer Sciences, vol. 1, no. 4, 2005. 41
- [Agrafiotis 2010] Dimitris K. Agrafiotis and John J. M. Wiener. *Scaffold Explorer: An Interactive Tool for Organizing and Mining Structure-Activity Data Spanning Multiple Chemotypes*. Journal of Medicinal Chemistry, vol. 53, no. 13, pages 5002–5011, 2010. PMID: 20524668. 48, 49

- [Agrawal 1990] Hiralal Agrawal and Joseph R. Horgan. *Dynamic program slicing*. In Proceedings of the ACM SIGPLAN 1990 conference on Programming language design and implementation, PLDI '90, pages 246–256, New York, NY, USA, 1990. ACM. 43
- [ah Kang 2011] Youn ah Kang, Carsten Görg and John Stasko. *How Can Visual Analytics Assist Investigative Analysis: Design Implications from an Evaluation*. IEEE Transactions on Visualization and Computer Graphics, vol. 17, no. 5, pages 570–583, may 2011. 49
- [ah Kang 2012] Youn ah Kang and John Stasko. *Examining the Use of a Visual Analytics System for Sensemaking Tasks: Case Studies with Domain Experts*. IEEE Transactions on Visualization and Computer Graphics, vol. 18, no. 12, pages 2869–2878, 2012. 49
- [Aigner 2005] Wolfgang Aigner, Silvia Miksch, Bettina Thurnher and Stefan Biffl. *PlanningLines: Novel Glyphs for Representing Temporal Uncertainties and Their Evaluation*. In Proceedings of the Ninth International Conference on Information Visualisation, IV '05, pages 457–463, Washington, DC, USA, 2005. IEEE Computer Society. 52, 54
- [Alcocer 2013] Juan Pablo Sandoval Alcocer, Alexandre Bergel Stéephane Ducasse and Marcus Denker. *Performance evolution blueprint: Understanding the impact of software evolution on performance*. In First IEEE Working Conference on Software Visualization (VISSOFT), 2013, pages 1–9, 2013. 305
- [Ali 2009] Jauhar Ali. *Cognitive support through visualization and focus specification for understanding large class libraries*. Journal of Visual Languages & Computing, vol. 20, no. 1, pages 50–59, 2009. 124, 306
- [Alsallakh 2012] Bilal Alsallakh, Wolfgang Aigner, Silvia Miksch and M. Eduard Groller. *Reinventing the Contingency Wheel: Scalable Visual Analytics of Large Categorical Data*. IEEE Transactions on Visualization and Computer Graphics, vol. 18, no. 12, pages 2849–2858, 2012. 49
- [Amicis 2009] Raffaele De Amicis, Giuseppe Conti, Bruno Simões, Raimondo Lattuca, Nicolò Tosi, Stefano Piffer and Giuseppe Pellitteri. *Geo-visual analytics for urban design in the context of future internet*. International Journal on Interactive Design and Manufacturing, vol. 3, pages 55–63, 2009. 10.1007/s12008-009-0060-1. 49

- [André 2007] Paul André, Max L. Wilson, Alistair Russell, Daniel A. Smith, Alisdair Owens and m.c. schraefel. *Continuum: designing timelines for hierarchies, relationships and scale*. In *UIST '07: Proceedings of the 20th annual ACM symposium on User interface software and technology*, pages 101–110, New York, NY, USA, 2007. ACM. 54
- [Andrews 1998] Keith Andrews and Helmut Heidegger. *Information Slices: Visualising and Exploring Large Hierarchies using Cascading, Semi-Circular Discs*. Late Breaking Hot Topic Paper, IEEE Symposium on Information Visualization (InfoVis'98), 1998. 52, 58
- [Andrienko 2007] Gennady Andrienko and Natalia Andrienko. *Coordinated Multiple Views: a Critical View*. International Conference on Coordinated and Multiple Views in Exploratory Visualization, vol. 0, pages 72–74, 2007. 48
- [Andrienko 2010] Gennady Andrienko, Natalia Andrienko, Sebastian Bremm, Tobias Schreck, Tatiana Von Landesberger, Peter Bak and Daniel Keim. *Space-in-Time and Time-in-Space Self-Organizing Maps for Exploring Spatiotemporal Patterns*. Computer Graphics Forum, vol. 29, no. 3, pages 913–922, 2010. 49
- [Andrienko 2012a] Gennady Andrienko, Natalia Andrienko, Michael Burch and M Daniel Weiskopf. *Visual Analytics Methodology for Eye Movement Studies*. IEEE Transactions on Visualization and Computer Graphics, vol. 18, no. 12, pages 2889–2898, 2012. 49
- [Andrienko 2012b] Gennady Andrienko, Natalia Andrienko, Martin Mladenov, Michael Mock and Christian Pölitiz. *Identifying Place Histories from Activity Traces with an Eye to Parameter Impact*. IEEE Transactions on Visualization and Computer Graphics, vol. 18, no. 5, pages 675–688, may 2012. 48
- [Andrienko 2013a] Gennady Andrienko, Natalia Andrienko, Christophe Hurter, Salvatore Rinzivillo, and Stefan Wrobel. *Scalable Analysis of Movement Data for Extracting and Exploring Significant Places*. IEEE Transactions on Visualization and Computer Graphics, vol. 19, no. 7, pages 1078–1094, 2013. 48
- [Andrienko 2013b] Natalia Andrienko and Gennady Andrienko. *A visual analytics framework for spatio-temporal analysis and modelling*. Data Mining and Knowledge Discovery, vol. 27, no. 1, pages 55–83, 2013. 49

- [Andrienko 2013c] Natalia Andrienko and Gennady Andrienko. *Visual analytics of movement: An overview of methods, tools and procedures*. Information Visualization, vol. 12, no. 1, pages 3–24, 01 2013. 48
- [Anslow 2009] Craig Anslow, James Noble, Stuart Marshall and Ewan Tempero. *Towards Visual Software Analytics*. In Proceedings of the Australasian Computing Doctoral Consortium (ACDC), Wellington, New Zealand, 2009. 76, 203, 317
- [Anslow 2010] Craig Anslow, Stuart Marshall, James Noble, Ewan Tempero and Robert Biddle. *User evaluation of polymetric views using a large visualization wall*. In Proceedings of the 5th International Symposium on Software visualization, SOFTVIS '10, pages 25–34, New York, NY, USA, 2010. ACM. XIV, 163, 306
- [Anslow 2013] Craig Anslow, Stuart Marshall, James Noble and Robert Biddle. *SourceVis: Collaborative software visualization for co-located environments*. In First IEEE Working Conference on Software Visualization (VISSOFT), 2013, pages 1–10, 2013. XIV, 164, 306
- [Arias-Hernandez 2012] Richard Arias-Hernandez, Tera M. Green and Brian Fisher. *From Cognitive Amplifiers to Cognitive Prostheses: Understandings of the Material Basis of Cognition in Visual Analytics*. Interdisciplinary Science Reviews, vol. 37, no. 1, pages 4 – 18, 2012. 49
- [Assogba 2010] Yannick Assogba and Judith Donath. *Share: a programming environment for loosely bound cooperation*. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, CHI '10, pages 961–970, New York, NY, USA, 2010. ACM. XV, 170, 171, 172, 173, 306
- [Bade 2004] Ragnar Bade, Stefan Schlechtweg and Silvia Miksch. *Connecting time-oriented data and information to a coherent interactive visualization*. In CHI '04: Proceedings of the SIGCHI conference on Human factors in computing systems, pages 105–112, New York, NY, USA, 2004. ACM. 54, 55
- [Bailey 1989] Robert W. Bailey. *Human performance engineering: Using human factors/ergonomics to achieve computer system usability* (2nd ed.). Prentice-Hall, Inc., Upper Saddle River, NJ, USA, 1989. 270

- [Baker 1995] Marla J. Baker and Stephen G. Eick. *Space-filling Software Visualization*. Journal of Visual Languages & Computing, vol. 6, no. 2, pages 119 – 133, 1995. [116](#), [143](#), [196](#), [313](#)
- [Ball 1996] Thomas Ball and Stephen G. Eick. *Software visualization in the large*. Computer, vol. 29, no. 4, pages 33–43, Apr 1996. [112](#)
- [Balzer 2005a] Michael Balzer and Oliver Deussen. *Exploring Relations within Software Systems Using Treemap Enhanced Hierarchical Graphs*. In 3rd IEEE International Workshop on Visualizing Software for Understanding and Analysis, 2005. VISSOFT 2005., pages 1–6, 2005. [XIII](#), [112](#), [119](#), [120](#), [121](#), [143](#)
- [Balzer 2005b] Michael Balzer, Oliver Deussen and Claus Lewerentz. *Voronoi treemaps for the visualization of software metrics*. In SoftVis '05: Proceedings of the 2005 ACM symposium on Software visualization, pages 165–172, New York, NY, USA, 2005. ACM Press. [XIII](#), [56](#), [117](#), [143](#)
- [Barbara 1987] A. Kitchenham Barbara. *Controlling software projects*. Electronics and Power, vol. 33, no. 5, pages 312–315, May 1987. [154](#)
- [Barlowe 2011] Scott Barlowe, Yujie Liu, Jing Yang, Dennis R. Livesay, Donald J. Jacobs, James Mottonen and Deeptak Verma. *WaveMap: Interactively Discovering Features From Protein Flexibility Matrices Using Wavelet-based Visual Analytics*. Computer Graphics Forum, vol. 30, no. 3, pages 1001–1010, 2011. [49](#)
- [Basole 2012] Rahul C. Basole, Mengdie Hu, Pritesh Patel and John T. Stasko. *Visual Analytics for Converging-Business-Ecosystem Intelligence*. IEEE Computer Graphics and Applications, vol. 32, no. 1, pages 92 –96, jan.-feb. 2012. [49](#), [50](#), [62](#)
- [Bass 2003] Len Bass, Paul Clements and Rick Kazman. Software architecture in practice, second edition. Addison-Wesley Professional, April 2003. [112](#)
- [Battista 1998] Giuseppe Di Battista, Peter Eades, Roberto Tamassia and Ioannis G. Tollis. Graph drawing: Algorithms for the visualization of graphs. Prentice Hall PTR, Upper Saddle River, NJ, USA, 1st édition, 1998. [52](#), [59](#)
- [Battke 2010] Florian Battke, Stephan Symons and Kay Nieselt. *Mayday - integrative analytics for expression data*. BMC Bioinformatics, vol. 11, pages 121 – 130, 2010. [48](#)

- [Batty 2013] Michael Batty. *Visually-Driven Urban Simulation: exploring fast and slow change in residential location*. Environment and Planning, vol. 45, no. 3, pages 532–552, 2013. 48
- [Baxter 1998] Ira D. Baxter, Andrew Yahin, Leonardo Moura, Marcelo Sant’Anna and Lorraine Bier. *Clone Detection Using Abstract Syntax Trees*. In Proceedings of the International Conference on Software Maintenance, ICSM ’98, pages 368–, Washington, DC, USA, 1998. IEEE Computer Society. 44
- [Baysal 2007] Olga Baysal and Andrew J. Malton. *Correlating Social Interactions to Release History During Software Evolution*. In Proceedings of the Fourth International Workshop on Mining Software Repositories, MSR ’07, pages 7–, Washington, DC, USA, 2007. IEEE Computer Society. 43, 44
- [Beck 2010] Fabian Beck and Stephan Diehl. *Visual comparison of software architectures*. In Proceedings of the 5th international symposium on Software visualization, SOFTVIS ’10, pages 183–192, New York, NY, USA, 2010. ACM. 306
- [Beck 2011] Fabian Beck, Radoslav Petkov and Stephan Diehl. *Visually exploring multi-dimensional code couplings*. In 6th IEEE International Workshop on Visualizing Software for Understanding and Analysis (VISSOFT), 2011, pages 1–8, 2011. 303
- [Beck 2013] Fabian Beck and Stephan Diehl. *Visual comparison of software architectures*. Information Visualization, vol. 12, no. 2, pages 178–199, 04 2013. XIII, XIV, 123, 124, 134, 135, 306
- [Ben-Ari 2011] Mordechai Ben-Ari, Roman Bednarik, Ronit Ben-Bassat Levy, Gil Ebel, Andrés Moreno, Niko Myller and Erkki Sutinen. *A decade of research and development on program animation: The Jeliot experience*. Journal of Visual Languages & Computing, vol. 22, no. 5, pages 375 – 384, 2011. 303
- [Benestad 2009] Hans Christian Benestad, Bente Anda and Erik Arisholm. *Understanding software maintenance and evolution by analyzing individual changes: a literature review*. Journal of Software Maintenance and Evolution: Research and Practice, vol. 21, no. 6, pages 349–378, 2009. 43
- [Bennedsen 2010] Jens Bennedsen and Carsten Schulte. *BlueJ Visual Debugger for Learning the Execution of Object-Oriented Programs?*

- Transactions on Computing Education, vol. 10, no. 2, pages 8:1–8:22, June 2010. 305
- [Bennett 2000] Keith H. Bennett and Václav T. Rajlich. *Software Maintenance and Evolution: A Roadmap*. In Proceedings of the Conference on The Future of Software Engineering, ICSE '00, pages 73–87, New York, NY, USA, 2000. ACM. 26, 29
- [Benomar 2013] Omar Benomar, Houari Sahraoui and Pierre Poulin. *Visualizing software dynamicities with heat maps*. In First IEEE Working Conference on Software Visualization (VISSOFT), 2013, pages 1–10, 2013. 306
- [Bentrad 2013] Sassi Bentrad and Djamel Meslati. *Visualizing and Analyzing the Structure of AspectJ Software under the Eclipse Platform*. International Journal of Software Engineering and Its Applications, vol. 7, no. 3, pages 353–376, May 2013. 116, 143, 306
- [Bernardin 2008] Tony Bernardin, Brian C. Budge and Bernd Hamann. *Stacked-widget visualization of scheduling-based algorithms*. In Proceedings of the 4th ACM symposium on Software visualization, SoftVis '08, pages 165–174, New York, NY, USA, 2008. ACM. 305
- [Béron 2008] Mario Béron, Daniela da Cruz, Maria João Varanda Pereira, Pedro Rangel Henriques and Roberto Uzal. *Evaluation Criteria of Software Visualization Systems used for Program Comprehension*. In Universidade de Évora, editeur, Interacção'08 – 3ª Conferência Interacção Pessoa-Máquina, Oct 2008. 303
- [Bertini 2011] Enrico Bertini and Giuseppe Santucci. *Improving visual analytics environments through a methodological framework for automatic clutter reduction*. Journal of Visual Languages and Computing, vol. 22, no. 3, pages 194 – 212, 2011. 49
- [Beyer 2006] Dirk Beyer and Ahmed E. Hassan. *Evolution Storyboards: Visualization of Software Structure Dynamics*. In 14th IEEE International Conference on Program Comprehension, 2006. ICPC 2006., pages 248–251, 2006. XIV, 135, 137, 144
- [Biersack 2012] Ernst Biersack, Quentin Jacquemart, Fabian Fischer, Johannes Fuchs, Olivier Thonnard, Georgios Theodoridis, Dimitrios Tzovaras and Pierre-Antoine Vervier. *Visual analytics for BGP monitoring and prefix hijacking identification*. IEEE Network, vol. 26, no. 6, pages 33–39, 2012. 48

- [Bocuzzo 2007] Sandro Bocuzzo and Harald Gall. *CocoViz: Towards Cognitive Software Visualizations*. In 4th IEEE International Workshop on Visualizing Software for Understanding and Analysis, 2007. VISSOFT 2007., pages 72–79, 2007. 303
- [Boehm 1988] Barry W. Boehm. *A spiral model of software development and enhancement*. IEEE Computer, vol. 21, no. 5, pages 61–72, May 1988. 21
- [Boehm 1999a] Barry Boehm, Alexander Egyed, Dan Port, Archita Shah, Julie Kwan and Ray Madachy. *A Stakeholder Win to Win Approach to Software Engineering Education*. Annals of Software Engineering, vol. 6, no. 1-4, pages 295–321, April 1999. 21
- [Boehm 1999b] Barry W. Boehm and Kevin J. Sullivan. *Software economics: status and prospects*. Information & Software Technology, vol. 41, no. 14, pages 937–946, 1999. 4, 308, 309
- [Boehm 2000] Barry W. Boehm and Kevin J. Sullivan. *Software Economics: A Roadmap*. In Proceedings of the Conference on The Future of Software Engineering, ICSE '00, pages 319–343, New York, NY, USA, 2000. ACM. 4, 309
- [Bohner 2002] Shawn A. Bohner. *Extending Software Change Impact Analysis into COTS Components*. In Proceedings of the 27th Annual NASA Goddard Software Engineering Workshop (SEW-27'02), SEW '02, pages 175–, Washington, DC, USA, 2002. IEEE Computer Society. 44
- [Bohnet 2007] Johannes Bohnet and Jürgen Döllner. *Facilitating Exploration of Unfamiliar Source Code by Providing 21/2D Visualizations of Dynamic Call Graphs*. In 4th IEEE International Workshop on Visualizing Software for Understanding and Analysis, 2007. VISSOFT 2007., pages 63–66, 2007. 306
- [Bohnet 2009a] Johannes Bohnet, Martin Koeleman and Juergen Doellner. *Visualizing massively pruned execution traces to facilitate trace exploration*. In 5th IEEE International Workshop on Visualizing Software for Understanding and Analysis, 2009. VISSOFT 2009., pages 57–64, 2009. 305
- [Bohnet 2009b] Johannes Bohnet, Stefan Voigt and Jürgen Döllner. *Projecting code changes onto execution traces to support localization of recently introduced bugs*. In Proceedings of the 2009 ACM Symposium

- on Applied Computing, SAC '09, pages 438–442, New York, NY, USA, 2009. ACM. 306
- [Bohnet 2011] Johannes Bohnet and Jürgen Döllner. *Monitoring code quality and development activity by software maps*. In Proceedings of the 2nd Workshop on Managing Technical Debt, MTD '11, pages 9–16, New York, NY, USA, 2011. ACM. 305
- [Booch 2005] Grady Booch, James Rumbaugh and Ivar Jacobson. Unified modeling language user guide, the (2nd edition) (addison-wesley object technology series). Addison-Wesley Professional, 2005. 128
- [Boukhelifa 2003] Nadia Boukhelifa and Peter J. Rodgers. *A model and software system for coordinated and multiple views in exploratory visualization*. Information Visualization, vol. 2, no. 4, pages 258–269, December 2003. 47
- [Bresciani 2009] Sabrina Bresciani and Martin J. Eppler. Identität und vielfalt der kommunikations-wissenschaft, chapitre The Risks of Visualization: a Classification of Disadvantages Associated with Graphic Representations of Information. UVK Verlagsgesellschaft mbH, 2009. 189
- [Briand 1999] Lionel C. Briand, Jürgen Wüst and Hakim Lounis. *Using Coupling Measurement for Impact Analysis in Object-Oriented Systems*. Proceedings IEEE International Conference on Software Maintenance (ICSM '99), 1999. 89
- [Broeksema 2011] Bertjan Broeksema and Alexandru Telea. *Visual support for porting large code bases*. In 6th IEEE International Workshop on Visualizing Software for Understanding and Analysis (VISSOFT), 2011, pages 1–8, 2011. 306
- [Buja 1996] Andreas Buja, Dianne Cook and Deborah F. Swayne. *Interactive High-Dimensional Data Visualization*. Journal of Computational and Graphical Statistics, vol. 5, no. 1, pages 78–99, 1996. 63
- [Burch 2011] Michael Burch, Corinna Vehlow, Fabian Beck, Stephan Diehl and Daniel Weiskopf. *Parallel Edge Splatting for Scalable Dynamic Graph Visualization*. IEEE Transactions on Visualization and Computer Graphics, vol. 17, no. 12, pages 2344–2353, 2011. 303
- [Buse 2012] Raymond P. L. Buse and Thomas Zimmermann. *Information Needs for Software Development Analytics*. In Proceedings of the 34th

- International Conference on Software Engineering, ICSE '12, pages 987–996, Piscataway, NJ, USA, 2012. IEEE Press. 38, 40
- [Buss 1994] E. Buss, R. De Mori, W. M. Gentleman, J. Henshaw, H. Johnson, K. Kontogiannis, E. Merlo, H. A.Müller, J. Mylopoulos, S. Paul, A. Prakash, M. Stanley, S. R. Tilley, J. Troster and K. Wong. *Investigating Reverse Engineering Technologies for the CAS Program Understanding Project*. IBM Systems Journal, vol. 33, no. 3, pages 477–500, July 1994. 44
- [Buxmann 2013] Peter Buxmann, Heiner Diefenbach and Thomas Hess. The software industry: Economic principles, strategies, perspectives, chapitre Economic Principles in the Software Industry, pages 19–53. Springer Publishing Company, Incorporated, 2013. 4, 309
- [Cain 2012] Aurora A. Cain, Robert Kosara and Cynthia J. Gibas. *GenoSets: Visual Analytic Methods for Comparative Genomics*. PLoS ONE, vol. 7, no. 10, pages 1 – 9, 2012. 48
- [Card 1999a] Stuart K. Card, Jock Mackinlay and Ben Shneiderman. Readings in information visualization: Using vision to think. 1999. 51
- [Card 1999b] Stuart K. Card, Jock D. Mackinlay and Ben Shneiderman, editeurs. Readings in information visualization: using vision to think. Morgan Kaufmann Publishers Inc., San Francisco, CA, USA, 1999. 47, 160, 198
- [Card 2006] Stuart K. Card, Bongwon Suh, Bryan A. Pendleton and Jeffrey Heer. *TimeTree: exploring time changing hierarchies*. In IEEE Symposium on Visual Analytics Science and Technology 2006 (VAST 2006), Baltimore; MD; USA. Piscataway NJ, 2006. IEEE Computer Society. 9, 55, 311
- [Carmel 1999] Erran Carmel. Global software teams: Collaborating across borders and time zones. Prentice Hall PTR, Upper Saddle River, NJ, USA, 1999. 24, 147
- [Carmel 2001] Erran Carmel and Ritu Agarwal. *Tactical Approaches for Alleviating Distance in Global Software Development*. IEEE Software, vol. 18, no. 2, pages 22–29, March 2001. 149
- [Caserta 2011a] Pierre Caserta and Olivier Zendra. *Visualization of the Static Aspects of Software: A Survey*. IEEE Transactions on Visualization and Computer Graphics, vol. 17, no. 7, pages 913–933, 2011. 303

- [Caserta 2011b] Pierre Caserta, Olivier Zendra and Damien Bodénès. *3D Hierarchical Edge bundles to visualize relations in a software city metaphor*. In 6th IEEE International Workshop on Visualizing Software for Understanding and Analysis (VISSOFT), 2011, pages 1–8, 2011. 303
- [Cassell 2011] Keith Cassell, Craig Anslow, Lindsay Groves and Peter Andraea. *Visualizing the Refactoring of Classes via Clustering*. In Mark Reynolds, editeur, Australasian Computer Science Conference (ACSC 2011), volume 113 of *CRPIT*, pages 63–72, Perth, Australia, 2011. ACS. 306
- [Castellanos-Garzón 2013] José A. Castellanos-Garzón, Carlos Armando García, Paulo Novais and Fernando Díaz. *A visual analytics framework for cluster analysis of DNA microarray data*. *Expert Syst. Appl.*, vol. 40, no. 2, pages 758–774, 2013. 48
- [Cataldo 2007] Marcelo Cataldo, Matthew Bass, James D. Herbsleb and Len Bass. *On Coordination Mechanisms in Global Software Development*. In Second IEEE International Conference on Global Software Engineering, 2007. ICGSE 2007., pages 71–80, Aug 2007. 152
- [Cegielski 2006] Casey G. Cegielski and Dianne J. Hall. *What Makes a Good Programmer?* *Communications of the ACM*, vol. 49, no. 10, pages 73–75, October 2006. 24
- [Chan 2010] Brian Chan, Ying Zou, Ahmed E. Hassan and Anand Sinha. *Visualizing the Results of Field Testing*. In IEEE 18th International Conference on Program Comprehension (ICPC), 2010, pages 114–123, 2010. 305
- [Charette 2005] Robert N. Charette. *Why software fails [software failure]*. *IEEE Spectrum*, vol. 42, no. 9, pages 42–49, Sept 2005. 3, 4, 308, 309
- [Chawla 2003] Sanjay Chawla, Bavani Arunasalam and Joseph Davis. *Mining Open Source Software (OSS) Data Using Association Rules Network*. In Kyu-Young Whang, Jongwoo Jeon, Kyuseok Shim and Jaideep Srivastava, editeurs, *Advances in Knowledge Discovery and Data Mining*, volume 2637 of *Lecture Notes in Computer Science*, pages 461–466. Springer Berlin Heidelberg, 2003. 43
- [Chen 2002] Chaomei Chen, Timothy Cribbin, Jasna Kuljis and Robert Macredie. *Footprints of information foragers: behaviour semantics of*

- visual exploration*. International Journal of Human-Computer Studies, vol. 57, no. 2, pages 139–163, August 2002. 62
- [Chen 2006] Chaomei Chen. *CiteSpace II: Detecting and visualizing emerging trends and transient patterns in scientific literature*. Journal of the American Society for Information Science and Technology, vol. 1, no. 57, pages 359–377, 2006. 56
- [Chen 2010] Chaomei Chen, Jian Zhang and Michael Vogeley. *Making sense of the evolution of a scientific domain: a visual analytic study of the Sloan Digital Sky Survey research*. Scientometrics, vol. 83, pages 669–688, 2010. 10.1007/s11192-009-0123-x. 48, 49
- [Chen 2013] Chaomei Chen. *Hindsight, insight, and foresight: a multi-level structural variation approach to the study of a scientific field*. Technology Analysis and Strategic Management, vol. 25, no. 6, pages 619–640, 2013. 49
- [Chi 2000] Ed H. Chi. *A Taxonomy of Visualization Techniques Using the Data State Reference Model*. In Proceedings of the IEEE Symposium on Information Visualization 2000, INFOVIS '00, pages 69–, Washington, DC, USA, 2000. IEEE Computer Society. 47, 198
- [Chiara 2011] Davide De Chiara, Vincenzo Del Fatto, Robert Laurini, Monica Sebillo and Giuliana Vitiello. *A choreom-based approach for visually analyzing spatial data*. Journal of Visual Languages and Computing, vol. 22, no. 3, pages 173 – 193, 2011. 49
- [Chidamber 1994] Shyam R. Chidamber and Chris F. Kemerer. *A Metrics Suite for Object Oriented Design*. IEEE Transactions in Software Engineering, vol. 20, no. 6, pages 476–493, June 1994. 41
- [Chillarege 1992] Ram Chillarege, Inderpal S. Bhandari, Jarir K. Chaar, Michael J. Halliday, Diane S. Moebus, Bonnie K. Ray and Man-Yuen Wong. *Orthogonal Defect Classification-A Concept for In-Process Measurements*. IEEE Transactions in Software Engineering, vol. 18, no. 11, pages 943–956, November 1992. 44
- [Chinchor 2010] Nancy A. Chinchor, James J. Thomas, Pak Chung-Wong, Michael G. Christel and William Ribarsky. *Multimedia Analysis + Visual Analytics = Multimedia Analytics*. Computer Graphics and Applications, IEEE, vol. 30, no. 5, pages 52 –60, sept.-oct. 2010. 48

- [Choudhury 2011] A.N.M. Imroz Choudhury and Paul Rosen. *Abstract visualization of runtime memory behavior*. In 6th IEEE International Workshop on Visualizing Software for Understanding and Analysis (VISSOFT), 2011, pages 1–8, 2011. 305
- [Chow 2008] Tsun Chow and Dac-Buu Cao. *A Survey Study of Critical Success Factors in Agile Software Projects*. Journal of Systems and Software, vol. 81, no. 6, pages 961–971, June 2008. 4, 308
- [Chui 2011] Kenneth K. H. Chui, Julia B. Wenger, Steven A. Cohen and Elena N. Naumova. *Visual Analytics for Epidemiologists: Understanding the Interactions Between Age, Time, and Disease with Multi- Panel Graphs*. PLoS ONE, vol. 6, no. 2, pages 1 – 8, 2011. 48
- [Chung-Wong 2009] Pak Chung-Wong, L. Ruby Leung, Michael J. Scott Ning Lu, Patrick Mackey, Harlan Foote, James Correia Jr., Z. Todd Taylor, Stephen D. Unwin Jianhua Xu and Antonio Sanfilippo. *Designing a Collaborative Visual Analytics Tool for Social and Technological Change Prediction*. Computer Graphics and Applications, IEEE, vol. 29, no. 5, pages 58 –68, sept.-oct. 2009. 48
- [Chung-Wong 2012a] Pak Chung-Wong, Han-Wei Shen, Christopher R. Johnson, Chaomei Chen and Robert B. Ross. *The Top 10 Challenges in Extreme-Scale Visual Analytics*. IEEE Computer Graphics and Applications, vol. 32, no. 4, pages 63–67, 2012. 50, 62
- [Chung-Wong 2012b] Pak Chung-Wong, Han-Wei Shen and Valerio Pascucci. *Exploratory Visualization Involving Incremental, Approximate Database Queries and Uncertainty*. IEEE Computer Graphics and Applications, vol. 32, no. 4, pages 55–62, 2012. 49
- [Cisar 2011] Sanja Maravic Cisar, Dragica Radosav, Robert Pinter and Petar Cisar. *Effectiveness of Program Visualization in Learning Java: a Case Study with Jeliot 3*. International Journal of Computers Communications & Control, vol. 6, no. 4, pages 669–682, 2011. 305
- [Cockburn 2000] Andy Cockburn and Bruce McKenzie. *An evaluation of cone trees*. In Proceedings of the 2000 British Computer Society Conference on Human-Computer Interaction, 2000. 57
- [Cockburn 2009] Andy Cockburn, Amy Karlson and Benjamin B. Bederson. *A review of overview+detail, zooming, and focus+context interfaces*. Journal ACM Computing Surveys, vol. 41, no. 1, pages 2:1–2:31, January 2009. 53, 63

- [Collard 2004] Michael L. Collard. *Meta-differencing: An Infrastructure for Source Code Difference Analysis*. PhD thesis, Kent, OH, USA, 2004. AAI3147487. 44
- [Collberg 2003] Christian Collberg, Stephen Kobourov, Jasvir Nagra, Jacob Pitts and Kevin Wampler. *A system for graph-based visualization of the evolution of software*. In *SoftVis '03: Proceedings of the 2003 ACM symposium on Software visualization*, pages 77–ff, New York, NY, USA, 2003. ACM. XIV, 140, 141, 144
- [Collins-Sussman 2004] B. Collins-Sussman, B. Fitzpatrick and M. Pilato. *Version control with subversion*. Sebastopol, CA USA: O'Reilly Media, Inc., 2004. ISBN: 0-596-00448-6. XII, 34
- [Colomo-Palacios 2012] Ricardo Colomo-Palacios, Pedro Soto-Acosta, Francisco J. García-Peñalvo and Ángel García-Crespo. *A Study of the Impact of Global Software Development in Packaged Software Release Planning*. *Journal of Universal Computer Science*, vol. 18, no. 19, pages 2646–2668, nov 2012. 11, 24, 38, 313
- [Colomo-Palacios 2013] Ricardo Colomo-Palacios, Cristina Casado-Lumbreras, Pedro Soto-Acosta, Francisco J. García-Peñalvo and Edmundo Tovar-Caro. *Competence gaps in software personnel: A multi-organizational study*. *Computers in Human Behavior*, vol. 29, no. 2, pages 456–461, 2013. 4, 150, 309
- [Colomo-Palacios 2014] Ricardo Colomo-Palacios, Cristina Casado-Lumbreras, Pedro Soto-Acosta, Francisco José García-Peñalvo and Edmundo Tovar. *Project Managers in Global Software Development Teams: A Study of the Effects on Productivity and Performance*. *Software Quality Control*, vol. 22, no. 1, pages 3–19, March 2014. 4, 24, 150, 309
- [Comfort 2007] Louise K. Comfort. *Crisis Management in Hindsight: Cognition, Communication, Coordination, and Control*. *Public Administration Review*, vol. 67, pages 189–197, 2007. 149, 151, 153, 154
- [Conchúir 2009] Eoin Ó. Conchúir, Par J. Agerfalk, Helena H. Olsson and Brian Fitzgerald. *Global Software Development: Where are the Benefits?* *Communications of the ACM*, vol. 52, no. 8, pages 127–131, 2009. 24, 147

- [Cooke 2013] Nancy J. Cooke, Jamie C. Gorman, Christopher W. Myers and Jasmine L. Duran. *Interactive Team Cognition*. Cognitive Science, vol. 37, no. 2, pages 255–285, 2013. 156
- [Cornelissen 2007] Bas Cornelissen, Danny Holten, Andy Zaidman, Leon Moonen, Jarke J. van Wijk and Arie van Deursen. *Understanding Execution Traces Using Massive Sequence and Circular Bundle Views*. In Proceedings of the 15th IEEE International Conference on Program Comprehension, ICPC '07, pages 49–58, Washington, DC, USA, 2007. IEEE Computer Society. 219, 329
- [Cornelissen 2009] Bas Cornelissen, Andy Zaidman, Arie van Deursen and Bart van Rompaey. *Trace visualization for program comprehension: A controlled experiment*. In IEEE 17th International Conference on Program Comprehension, 2009. ICPC '09., pages 100–109, 2009. 305
- [Cosma 2007] Dan C. Cosma and Radu Marinescu. *Distributable Features View: Visualizing the Structural Characteristics of Distributed Software Systems*. In 4th IEEE International Workshop on Visualizing Software for Understanding and Analysis, 2007. VISSOFT 2007., pages 55–62, 2007. 305
- [Cottam 2008] Joseph A. Cottam, Joshua Hursey and Andrew Lumsdaine. *Representing unit test data for large scale software development*. In Proceedings of the 4th ACM symposium on Software visualization, SoftVis '08, pages 57–66, New York, NY, USA, 2008. ACM. 305
- [Crouser 2012] R. Jordan Crouser, Daniel E. Kee, Dong Hyun Jeong and Remco Chang. *Two Visualization Tools for Analyzing Agent-Based Simulations in Political Science*. IEEE Computer Graphics and Applications, vol. 32, no. 1, pages 67–77, 2012. 48
- [Dainton 2015] Marianne Dainton and Elaine D. Zelle. *Applying Communication Theory for Professional Life : A Practical Introduction*. Sage Publications, Inc, 2015. 150
- [D'Ambros 2006a] Marco D'Ambros and Michele Lanza. *Applying the Evolution Radar to PostgreSQL*. In Proceedings of the 2006 International Workshop on Mining Software Repositories, MSR '06, pages 177–178, New York, NY, USA, 2006. ACM. XIV, 140, 142, 144
- [D'Ambros 2006b] Marco D'Ambros and Michele Lanza. *Software Bugs and Evolution: A Visual Approach to Uncover Their Relationship*. In Proceedings of the Conference on Software Maintenance and

- Reengineering, CSMR '06, pages 229–238, Washington, DC, USA, 2006. IEEE Computer Society. 181
- [D'Ambros 2006c] Marco D'Ambros, Michele Lanza and Mircea Lungu. *The Evolution Radar: Visualizing Integrated Logical Coupling Information*. In Proceedings of the 2006 International Workshop on Mining Software Repositories, MSR '06, pages 26–32, New York, NY, USA, 2006. ACM. 140, 144
- [D'Ambros 2007a] Marco D'Ambros and Michele Lanza. *BugCrawler: Visualizing Evolving Software Systems*. In Software Maintenance and Reengineering, 2007. CSMR '07. 11th European Conference on, pages 333–334, March 2007. 181
- [D'Ambros 2007b] Marco D'Ambros, Michele Lanza and Martin Pinzger. *"A Bug's Life" Visualizing a Bug Database*. In 4th IEEE International Workshop on Visualizing Software for Understanding and Analysis, 2007. VISSOFT 2007., pages 113–120, 2007. 306
- [D'Ambros 2008] Marco D'Ambros, Harald C. Gall, Michele Lanza and Martin Pinzger. *Analyzing software repositories to understand software evolution*. In Software Evolution, 2008. 8, 30, 196, 313
- [D'Ambros 2009a] Marco D'Ambros and Michele Lanza. *Visual software evolution reconstruction*. Journal of Software Maintenance and Evolution: Research and Practice, vol. 21, no. 3, pages 217–232, 2009. 30, 303
- [D'Ambros 2009b] Marco D'Ambros, Michele Lanza and Mircea Lungu. *Visualizing Co-Change Information with the Evolution Radar*. IEEE Transactions on Software Engineering, vol. 35, no. 5, pages 720–735, 2009. 41, 90, 140, 144, 303
- [D'Ambros 2011] Marco D'Ambros, Michele Lanza, Mircea Lungu and Romain Robbes. *On porting software visualization tools to the web*. International Journal on Software Tools for Technology Transfer, vol. 13, no. 2, pages 181–200, 2011. 303
- [Danese 2010] Maria Danese, Urska Demsar, Nicola Masini and Martin Charlton. *Investigating material decay of historic building using visual analytics with multi-temporal infrared thermographic data*. Archaeometry, vol. 52, no. 3, pages 482–501, 2010. 48

- [Dang 2013] Tuan Nhon Dang, Anushka Anand and Leland Wilkinson. *TimeSeer: Scagnostics for High-Dimensional Time Series*. IEEE Transactions on Visualization and Computer Graphics, vol. 19, no. 3, pages 470–483, 2013. 49
- [Davenport 2006] Thomas H. Davenport. *Competing on Analytics*. Harvard Business Review, vol. 84, no. 1, pages 98–107, January 2006. 6
- [de Bono 2012] Bernard de Bono, Pierre Grenon and Stephen John Sammut. *ApiNATOMY: A novel toolkit for visualizing multiscale anatomy schematics with phenotype-related information*. Human Mutation, vol. 33, no. 5, pages 837–848, 2012. 48
- [de Oliveira Barros 2004] Márcio de Oliveira Barros, Cláudia Maria Lima Werner and Guilherme Horta Travassos. *Supporting risks in software project management*. Journal of Systems and Software, vol. 70, no. 1–2, pages 21 – 35, 2004. 10, 312
- [de Souza 2007] Cleidson R. B. de Souza, Stephen Quirk, Erik Trainer and David F. Redmiles. *Supporting collaborative software development through the visualization of socio-technical dependencies*. In Proceedings of the 2007 International ACM Conference on Supporting Group Work, GROUP '07, pages 147–156, New York, NY, USA, 2007. ACM. 306
- [Deelen 2007] Pieter Deelen, Frank van Ham, Cornelis Huizing and Huub van de Wetering. *Visualization of Dynamic Program Aspects*. In 4th IEEE International Workshop on Visualizing Software for Understanding and Analysis, 2007. VISSOFT 2007., pages 39–46, 2007. 305
- [Deng 2011] Fang Deng, Nicholas DiGiuseppe and James A. Jones. *Constellation visualization: Augmenting program dependence with dynamic information*. In 6th IEEE International Workshop on Visualizing Software for Understanding and Analysis (VISSOFT), 2011, pages 1–8, 2011. 306
- [Diehl 2007] Stephan Diehl. *Software visualization visualizing the structure, behaviour, and evolution of software*. Springer Berlin Heidelberg New York, 2007. 11, 196, 310, 313
- [Dinkla 2011] Kau Dinkla, Michel A. Westenberg, Hau Timmerman, Sacha A. F. T. van Hijum and Jack van Wijk. *Comparison of Multiple Weighted*

- Hierarchies: Visual Analytics for Microbe Community Profiling*. Computer Graphics Forum, vol. 30, no. 3, pages 1141–1150, 2011. 49
- [Dix 1998] Alan Dix and Geoffrey Ellis. *Starting simple: adding value to static visualisation through simple interaction*. In Proceedings of the working conference on Advanced visual interfaces, AVI '98, pages 124–134, New York, NY, USA, 1998. ACM. 63
- [Dix 2010] Alan Dix, Margit Pohl and Geoffrey Ellis. Mastering the information age solving problems with visual analytics, chapitre Perception and Cognitive Aspects, pages 109 – 130. Eurographics Association, 2010. 50, 197, 311
- [Dransch 2010] Doris Dransch, Patrick Kothur, Sven Schulte, Volker Klemann and Henryk Dobsław. *Assessing the quality of geoscientific simulation models with visual analytics methods—a design study*. International Journal of Geographical Information Science, vol. 24, no. 10, pages 1459–1479, October 2010. 49
- [Draper 2009] Geoffrey M. Draper, Yarden Livnat and Richard F. Riesenfeld. *A Survey of Radial Methods for Information Visualization*. IEEE Transactions on Visualization and Computer Graphics, vol. 15, no. 5, pages 759–776, 2009. 59
- [Drigas 2011] Athanasios Drigas, Lefteris Koukianakis and Yannis Papagerasimou. *Towards an ICT-based psychology: E-psychology*. Computers in Human Behavior, vol. 27, no. 4, pages 1416 – 1423, July 2011. 202
- [Ducasse 2005] Stéphane Ducasse and Michele Lanza. *The Class Blueprint: Visually Supporting the Understanding of Classes*. IEEE Transactions in Software Engineering, vol. 31, no. 1, pages 75–90, January 2005. 127, 144
- [Ducheneaut 2005] Nicolas Ducheneaut. *Socialization in an Open Source Software Community: A Socio-Technical Analysis*. Journal Computer Supported Cooperative Work, vol. 14, no. 4, pages 323–368, August 2005. 43, 44
- [Ebert 2001a] Christof Ebert and Philip De Neve. *Surviving Global Software Development*. IEEE Software, vol. 18, no. 2, pages 62–69, March 2001. 24

- [Ebert 2001b] Christof Ebert, Casimiro Hernandez Parro, Roland Suttels and Harald Kolarczyk. *Improving Validation Activities in a Global Software Development*. In Proceedings of the 23rd International Conference on Software Engineering, ICSE '01, pages 545–554, Washington, DC, USA, 2001. IEEE Computer Society. 24
- [Eichelberger 2008] Holger Eichelberger. *Automatic layout of UML use case diagrams*. In Proceedings of the 4th ACM symposium on Software visualization, SoftVis '08, pages 105–114, New York, NY, USA, 2008. ACM. 304
- [Eick 2002] Stephen G. Eick, Todd L. Graves, Alan F. Karr, Audris Mockus and Paul Schuster. *Visualizing Software Changes*. IEEE Transactions in Software Engineering, vol. 28, no. 4, pages 396–412, 2002. 161
- [El-Nasr 2013] Magy Seif El-Nasr, Heather Desurvire, Bardia Aghabeigi and Anders Drachen. *Game Analytics for Game User Research, Part 1: A Workshop Review and Case Study*. IEEE Computer Graphics and Applications, vol. 33, no. 2, pages 6–11, 2013. 49
- [El-Sappagh 2011] Shaker H. Ali El-Sappagh, Abdeltawab M. Ahmed Hendawi and Ali Hamed El Bastawissy. *A proposed model for data warehouse {ETL} processes*. Journal of King Saud University - Computer and Information Sciences, vol. 23, no. 2, pages 91 – 104, 2011. 198
- [Elmqvist 2012] Niklas Elmqvist and David S. Ebert. *Leveraging Multidisciplinarity in a Visual Analytics Graduate Course*. IEEE Computer Graphics and Applications, vol. 32, no. 3, pages 84–87, 2012. 49
- [Endsley 1995] Mica R. Endsley. *Toward a Theory of Situation Awareness in Dynamic Systems*. Human Factors: The Journal of the Human Factors and Ergonomics Society, vol. 37, no. 1, pages 32–64, 1995. 157, 160
- [Erdemir 2011] Ural Erdemir, Umut Tekin and Feza Buzluca. *E-Quality: A graph based object oriented software quality visualization tool*. In 6th IEEE International Workshop on Visualizing Software for Understanding and Analysis (VISSOFT), 2011, pages 1–8, 2011. 305
- [Erra 2012a] Ugo Erra and Giuseppe Scanniello. *Towards the visualization of software systems as 3D forests: the CodeTrees environment*. In Proceedings of the 27th Annual ACM Symposium on Applied

- Computing, SAC '12, pages 981–988, New York, NY, USA, 2012. ACM. 303
- [Erra 2012b] Ugo Erra, Giuseppe Scanniello and Nicola Capece. *Visualizing the Evolution of Software Systems Using the Forest Metaphor*. In 16th International Conference on Information Visualisation (IV), 2012, pages 87–92, 2012. 303
- [Estublier 1999] Jacky Estublier. *Distributed Objects for Concurrent Engineering*. In Proceedings of the 9th International Symposium on System Configuration Management, SCM-9, pages 172–185, London, UK, UK, 1999. Springer-Verlag. 5, 23, 309
- [Estublier 2000] Jacky Estublier. *Software configuration management: a roadmap*. In Proceedings of the Conference on The Future of Software Engineering, ICSE '00, pages 279–289, New York, NY, USA, 2000. ACM. 8, 30, 33, 34
- [Fabriek 2008] Matthias Fabriek, Mischa van den Brand, Sjaak Brinkkemper, Frank Harmsen and Remko Helms. *Reasons for Success and Failure in Offshore Software Development Projects*. In Proceedings of the 16th European Conference on Information Systems, ECIS 2008, Galway, Ireland, 2008, pages 446–457, 2008. 5, 309
- [Fallick 2006] Bruce Fallick, Charles A. Fleischman and James B. Rebitzer. *Job-Hopping in Silicon Valley: Some Evidence Concerning the Microfoundations of a High-Technology Cluster*. Review of Economics and Statistics, vol. 88, no. 3, pages 472 – 481, October 2006. 7, 27
- [Feigenspan 2013] Janet Feigenspan, Christian Kästner, Sven Apel, Jörg Liebig, Michael Schulze, Raimund Dachsel, Maria Papendieck, Thomas Leich and Gunter Saake. *Do background colors improve program comprehension in the ifdef hell?* Empirical Software Engineering, vol. 18, no. 4, pages 699–745, 2013. 303
- [Femmer 2011] Henning Femmer, Nora Broy, Marin Zec, Asa MacWilliams and Roland Eckl. *Dynamic Software Visualization with BusyBorg - A Proof of Concept*. In IEEE 35th Annual Computer Software and Applications Conference (COMPSAC), 2011, pages 492–497, 2011. 305
- [Fenton 2000] Norman E. Fenton and Martin Neil. *Software Metrics: Roadmap*. In Proceedings of the Conference on The Future of Software Engineering, ICSE '00, pages 357–370, New York, NY, USA, 2000. ACM. 44

- [Fernandez-Ramil 2008] Juan Fernandez-Ramil, Angela Lozano, Michel Wermelinger and Andrea Capiluppi. Software evolution, chapitre Empirical Studies of Open Source Evolution, pages 263 – 288. Sp, 2008. 8
- [Fiore 2004a] Stephen M. Fiore and Eduardo Salas. Team cognition: Understanding the factors that drive process and performance, chapitre Advances in measuring team cognition., pages 83–106. American Psychological Association, Washington, DC, US, 2004. 148, 155, 156, 159
- [Fiore 2004b] Stephen M. Fiore and Eduardo Salas. Team cognition: Understanding the factors that drive process and performance, chapitre Why we need team cognition., pages 235–248. American Psychological Association, Washington, DC, US, 2004. 156, 157
- [Fischer 1978] Kurt F. Fischer. *Software Quality Assurance Tools: Recent Experience and Future Requirements*. SIGSOFT Software Engineering Notes, vol. 3, no. 5, pages 116–121, January 1978. 154
- [Fischer 2005] Michael Fischer, Johann Oberleitner, Harald Gall and Thomas Gschwind. *System evolution tracking through execution trace analysis*. In Proceedings. 13th International Workshop on Program Comprehension, 2005. IWPC 2005., pages 237–246, May 2005. 43
- [Fluri 2007] Beat Fluri, Michael Wuersch, Martin Pinzger and Harald Gall. *Change Distilling: Tree Differencing for Fine-Grained Source Code Change Extraction*. IEEE Transactions in Software Engineering, vol. 33, no. 11, pages 725–743, November 2007. 44
- [Forsberg 2005] Kevin Forsberg, Hal Mooz and Howard Cotterman. Visualizing project management: Models and frameworks for mastering complex systems. John Wiley & Sons, 3rd édition, September 2005. 10, 312
- [Frisch 2010] Mathias Frisch and Raimund Dachsel. *Off-screen visualization techniques for class diagrams*. In Proceedings of the 5th international symposium on Software visualization, SOFTVIS '10, pages 163–172, New York, NY, USA, 2010. ACM. 305
- [Frisch 2013] Mathias Frisch and Raimund Dachsel. *Visualizing offscreen elements of node-link diagrams*. Information Visualization, vol. 12, no. 2, pages 133–162, 04 2013. 305

- [Fry 2008] Ben Fry. Visualizing data - exploring and explaining data with the processing environment. O'Reilly, 2008. 47, 198
- [Fua 1999] Ying-Huey Fua, Matthew O. Ward and Elke A. Rundensteiner. *Hierarchical parallel coordinates for exploration of large datasets*. In Proceedings of the conference on Visualization '99: celebrating ten years, VIS '99, pages 43–50, Los Alamitos, CA, USA, 1999. IEEE Computer Society Press. 60
- [Furnas 1986] George W. Furnas. *Generalized Fisheye Views*. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, CHI '86, pages 16–23, New York, NY, USA, 1986. ACM. 52, 53
- [Gaither 2012] Kelly P. Gaither, Hank Childs, Karl W. Schulz, Cyrus Harrison, William Barth, Diego Donzis and Pui-Kuen Yeung. *Visual Analytics for Finding Critical Structures in Massive Time-Varying Turbulent-Flow Simulations*. IEEE Computer Graphics and Applications, vol. 32, no. 4, pages 34–45, 2012. 49
- [Gall 1998] Harald Gall, Karin Hajek and Mehdi Jazayeri. *Detection of logical coupling based on product release history*. In Proceedings., International Conference on Software Maintenance, 1998., pages 190–198, Nov 1998. 44, 90
- [Gall 2003] Harald Gall, Mehdi Jazayeri and Jacek Krajewski. *CVS Release History Data for Detecting Logical Couplings*. In IWPSE '03: Proceedings of the 6th International Workshop on Principles of Software Evolution, page 13, Washington, DC, USA, 2003. IEEE Computer Society. 41, 44, 141
- [Gallagher 2008] Keith Gallagher, Andrew Hatch and Malcolm Munro. *Software Architecture Visualization: An Evaluation Framework and Its Application*. IEEE Transactions on Software Engineering, vol. 34, no. 2, pages 260–270, 2008. 303
- [Gansner 2000] Emden R. Gansner and Stephen C. North. *An Open Graph Visualization System and Its Applications to Software Engineering*. Software Practice and Experience, vol. 30, no. 11, pages 1203–1233, September 2000. 140
- [García-Peñalvo 2000] Francisco J. García-Peñalvo. Modelo de reutilización soportado por estructuras complejas de reutilización denominadas mecanos, volume 53. Ediciones Universidad de Salamanca, Colección Vitor, 2000. 4, 309

- [García-Peñalvo 2002] Francisco J. García-Peñalvo, Juan-Antonio Barras, Miguel Ángel Laguna and José Manuel Marqués. *Product Line Variability Support by FORM and Mecano Model Integration*. SIGSOFT Software Engineering Notes, vol. 27, no. 1, pages 35–38, January 2002. 4, 309
- [García-Peñalvo 2011] Francisco J. García-Peñalvo, Ricardo Colomo Palacios, Pedro Soto-Acosta, Isabel Martínez-Conesa and Enric Serradell-López. *SemSEDoc: Utilización de tecnologías semánticas en el aprovechamiento de los repositorios documentales de los proyectos de desarrollo de software*. Information Research, vol. 16, no. 4, 2011. 8
- [García-Peñalvo 2012a] Francisco J. García-Peñalvo, Ricardo Colomo-Palacios, Juan García and Roberto Therón. *Towards an ontology modeling tool. A validation in software engineering scenarios*. Expert Systems with Applications, vol. 39, no. 13, pages 11468 – 11478, 2012. 48
- [García-Peñalvo 2012b] Francisco J. García-Peñalvo, María J. Rodríguez Conde, Antonio Miguel Seoane Pardo, Miguel Angel Conde González, Valentina Zangrando and Alicia García Holgado. *GRIAL (Grupo de investigación en InterAcción y eLearning), USAL*. IE Comunicaciones: Revista Iberoamericana de Informática Educativa, no. 15, pages 85–94, 2012. 14, 245
- [García-Peñalvo 2012c] Francisco J. García-Peñalvo, Ricardo Colomo Palacios, Juan García and Roberto Therón. *Towards an ontology modeling tool. A validation in software engineering scenarios*. Expert Systems Application, vol. 39, no. 13, pages 11468–11478, 2012. 9, 14, 311
- [García-Peñalvo 2014] Francisco J. García-Peñalvo, Patricia Ordóñez de Pablos, Juan García and Roberto Therón. *Using OWL-VisMod through a decision-making process for reusing OWL ontologies*. Behaviour & IT, vol. 33, no. 5, pages 426–442, 2014. 9, 14, 48, 311
- [García 2009a] Carlos Armando García, Roberto Therón, Rafael Peláez, José Luis López-Pérez and Gustavo Santos-García. *Visual Evaluation of Clustered Molecules in the Process of New Drugs Design*. In Smart Graphics, 9th International Symposium, SG 2009, Salamanca, Spain, May 28-30, 2009. Proceedings, pages 3–14, 2009. 14, 49

- [García 2009b] Juan García, Antonio González-Torres, Diego A. Gómez-Aguilar, Roberto Therón and Francisco J. García-Peñalvo. *A Visual Analytics Tool for Software Project Structure and Relationships among Classes*. In Proceedings of the 10th International Symposium on Smart Graphics, SG '09, pages 203–212, Berlin, Heidelberg, 2009. Springer-Verlag. XIII, 117, 118, 143
- [García 2012] Juan García. *Análítica Visual Aplicada a la Ingeniería de Ontologías*. PhD thesis, University of Salamanca, 2012. 9, 14, 48, 311
- [Garousi 2010] Vahid Garousi and James Leitch. *IssuePlayer: An extensible framework for visual assessment of issue management in software development projects*. Journal of Visual Languages & Computing, vol. 21, no. 3, pages 121 – 135, 2010. 305
- [Gartner 2013] Inc. Gartner. *Gartner Says Worldwide IT Spending on Pace to Reach 3.7 Trillion in 2013*. Website, July 2013. 4, 308
- [Gartner 2014] Inc. Gartner. *Gartner Says Worldwide IT Spending on Pace to Reach 3.8 Trillion in 2014*. Website, January 2014. 4, 308
- [German 2006] Daniel M. German and Abram Hindle. *Visualizing the Evolution of Software Using Softchange*. International Journal of Software Engineering and Knowledge Engineering, vol. 16, no. 1, pages 5–22, 2006. 41
- [Gethers 2012] Malcom Gethers, Bogdan Dit, Huzefa Kagdi and Denys Poshyvanyk. *Integrated Impact Analysis for Managing Software Changes*. In Proceedings of the 34th International Conference on Software Engineering, ICSE '12, pages 430–440, Piscataway, NJ, USA, 2012. IEEE Press. 43, 44
- [Gibson 2013] Helen Gibson, Joe Faith and Paul Vickers. *A survey of two-dimensional graph layout techniques for information visualisation*. Information Visualization, vol. 12, no. 3-4, pages 324–357, 07 2013. 52, 60
- [Gîrba 2004] Tudor Gîrba, Stéphane Ducasse and Michele Lanza. *Yesterday's Weather: guiding early reverse engineering efforts by summarizing the evolution of changes*. In Proceedings. 20th IEEE International Conference on Software Maintenance, 2004., pages 40–49, Sept 2004. 44

- [Gîrba 2005] Tudor Gîrba, Adrian Kuhn, Mauricio Seeberger and Stéphane Ducasse. *How Developers Drive Software Evolution*. In Proceedings of the Eighth International Workshop on Principles of Software Evolution, IWPSE '05, pages 113–122, Washington, DC, USA, 2005. IEEE Computer Society. XIV, 164, 165, 167
- [Godart 2001] Claude Godart, Gilles Halin, Jean-Claude Bignon, Christophe Bouthier, O Malcurat and Pascal Molli. *Implicit or explicit coordination of virtual teams in building design*. In Proceedings of the Sixth Conference on Computer Aided Architectural Design Research in Asia, pages 429–434, 2001. 151
- [Godfrey 2005] Michael W. Godfrey and Lijie Zou. *Using Origin Analysis to Detect Merging and Splitting of Source Code Entities*. IEEE Transactions in Software Engineering, vol. 31, pages 166–181, February 2005. 43, 44
- [Gómez-Aguilar 2009] Diego A. Gómez-Aguilar, Roberto Therón and Francisco J. García-Peñalvo. *Semantic Spiral Timelines Used as Support for e-Learning*. Journal of Universal Computer Science, vol. 15, no. 7, pages 1526–1545, April 2009. 9, 14, 48, 55, 311
- [Gómez-Aguilar 2010] Diego A. Gómez-Aguilar, Cristóbal Suárez Guerrero, Roberto Therón and Francisco J. García-Peñalvo. Advances in learning processes, chapitre Visual Analytics to Support E-learning, pages 207–228. InTech, January 2010. 55
- [Gómez-Aguilar 2014] Diego A. Gómez-Aguilar, Francisco J. García-Peñalvo and Roberto Therón. *Analítica visual en e-learning*. El Profesional de la Información, vol. 23, no. 3, pages 236–245, 2014. 14, 48
- [Gómez-Aguilar 2015a] Diego A. Gómez-Aguilar. *Analítica Visual en eLearning*. PhD thesis, Universidad de Salamanca, April 2015. 14, 48, 60
- [Gómez-Aguilar 2015b] Diego A. Gómez-Aguilar, Ángel Hernández-García, Francisco J. García-Peñalvo and Roberto Therón. *Tap into visual analysis of customization of grouping of activities in eLearning*. Computers in Human Behavior, vol. 47, no. 0, pages 60 – 67, 2015. Learning Analytics, Educational Data Mining and data-driven Educational Decision Making. 9, 14, 48, 60, 311
- [Gómez 2010] Verónica Uquillas Gómez, Stéphane Ducasse and Theo D'Hondt. *Visually Supporting Source Code Changes Integration: The*

- Torch Dashboard*. In 17th Working Conference on Reverse Engineering (WCRE), 2010, pages 55–64, 2010. 306
- [González-Torres 2009] Antonio González-Torres, Roberto Therón, Alexandru Telea and Francisco J. García-Peñalvo. *Combined visualization of structural and metric information for software evolution analysis*. In Proceedings of the joint international and annual ERCIM workshops on Principles of software evolution (IWPSE) and software evolution (Evol) workshops, IWPSE-Evol '09, pages 25–30, New York, NY, USA, 2009. ACM. XIV, 132, 133, 196
- [González-Torres 2011] Antonio González-Torres, Roberto Therón, Francisco J. García-Peñalvo, Michel Wermelinger and Yijun Yu. *Maleku: an evolutionary visual software analytics tool for providing insights into software evolution*. In IEEE Computer Society, editeur, IEEE International Conference on Software Maintenance (ICSM), 2011. 207, 322
- [González-Torres 2013a] Antonio González-Torres, Francisco J. García-Peñalvo and Roberto Therón. *How Evolutionary Visual Software Analytics Supports Knowledge Discovery*. Journal of Information Science and Engineering, vol. 29, no. 1, pages 17–34, 1 2013. 49, 207, 289, 310, 322, 353
- [González-Torres 2013b] Antonio González-Torres, Francisco J. García-Peñalvo and Roberto Therón. *Human-Computer interaction in evolutionary visual software analytics*. Computers in Human Behavior, vol. 29, no. 2, pages 486–495, March 2013. 9, 49, 207, 289, 310, 311, 322, 353
- [González-Torres 2014] Antonio González-Torres. Representación visual de sistemas de software: Evolución y colaboración. Master's thesis, Universidad de Salamanca, June 2014. XVI, 215
- [Goodall 2010] John R. Goodall, Hassan Radwan and Lenny Halseth. *Visual analysis of code security*. In Proceedings of the 7 International Symposium on Visualization for Cyber Security, VizSec '10, pages 46–51, New York, NY, USA, 2010. ACM. 305
- [Gotz 2008] David Gotz and Michelle X. Zhou. *Characterizing users' visual analytic activity for insight provenance*. In IEEE Symposium on Visual Analytics Science and Technology, 2008. VAST '08., pages 123–130, oct. 2008. 49

- [Goulão 2012] Miguel Goulão, Nelson Fonte, Michel Wermelinger and Fernando Brito e Abreu. *Software Evolution Prediction Using Seasonal Time Analysis: A Comparative Study*. In Proceedings of the 2012 16th European Conference on Software Maintenance and Reengineering, CSMR '12, pages 213–222, Washington, DC, USA, 2012. IEEE Computer Society. 44
- [Gouveia 2013] Carlos Gouveia, José Campos and Rui Abreu. *Using HTML5 visualizations in software fault localization*. In Software Visualization (VISSOFT), 2013 First IEEE Working Conference on, pages 1–10, 2013. 305
- [Gra 2002] Graph Drawing 2002. Rings: A technique for visualization of large hierarchies. Springer-Verlag, April 2002. 52, 57, 58
- [Green 2011] Pam Green, Peter C.R. Lane, Austen Rainer and Sven-Bodo Scholz. Research and development in intelligent systems xxvii, chapitre Selecting Features in Origin Analysis, pages 379–392. Springer London, January 2011. 43
- [Green 2012] Tera M. Green and Brian Fisher. *Impact of personality factors on interface interaction and the development of user profiles: Next steps in the personal equation of interaction*. Information Visualization, vol. 11, no. 3, pages 205–221, 07 2012. 49
- [Gribov 2010] Alexander Gribov, Martin Sill, Sonja Luck, Frank Rucker, Konstanze Dohner, Lars Bullinger, Axel Benner and Antony Unwin. *SEURAT: Visual analytics for the integrated analysis of microarray data*. BMC Medical Genomics, vol. 3, no. 1, page 21, 2010. 48
- [Group 2013] The Standish Group. *The Chaos Manifesto*, 2013. 4, 308
- [Grubb 2003] Penny Grubb and Armstrong A. Takang. Software maintenance: Concepts and practice. World Scientific, 2nd édition, 2003. 21, 27
- [Guo 2011] Diansheng Guo and Hai Jin. *iRedistrict: Geovisual analytics for redistricting optimization*. Journal of Visual Languages and Computing, vol. 22, no. 4, pages 279 – 289, 2011. 49
- [Hall 2013] Jamie Guevara Eric Stegman Linda Hall. *Gartner IT Key Metrics Data: 2013 IT Enterprise Summary Report*. Website, March 2013. 4, 308

- [Hao 2010] Ming C. Hao, Ratnesh K. Sharma, Daniel A. Keim, Umeshwar Dayal, Chandrakant D. Patel and Ravigopal Vennelakanti. *Application of Visual Analytics for Thermal State Management in Large Data Centres*. Computer Graphics Forum, vol. 29, no. 6, pages 1895–1904, 2010. 48
- [Hardisty 2010] Frank Hardisty and Alexander Klippel. *Analysing spatio-temporal autocorrelation with LISTA-Viz*. International Journal of Geographical Information Science, vol. 24, no. 10, pages 1515 – 1526, 2010. 49
- [Harel 2008] David Harel and Itai Segall. *Visualizing inter-dependencies between scenarios*. In Proceedings of the 4th ACM symposium on Software visualization, SoftVis '08, pages 145–153, New York, NY, USA, 2008. ACM. 305
- [Harrison 2011] L. Harrison, Wenwen Dou, Aidong Lu, W. Ribarsky and Xiaoyu Wang. *Guiding security analysis through visualization*. In 2011 IEEE Conference on Visual Analytics Science and Technology (VAST), pages 317 –318, oct. 2011. 9, 311
- [Hasenauer 2012] Jan Hasenauer, Julian Heinrich, Malgorzata Doszczak, Peter Scheurich, Daniel Weiskopf and Frank Allgower. *A visual analytics approach for models of heterogeneous cell populations*. EURASIP Journal on Bioinformatics and Systems Biology, vol. 2012, no. 1, page 4, 2012. 48
- [Hassan 2005] Ahmed E. Hassan. *Mining software repositories to assist developers and support managers*. PhD thesis, Waterloo, Ont., Canada, Canada, 2005. 8, 42, 196, 204, 313, 320
- [Hassan 2006] Ahmed E. Hassan. *Mining Software Repositories to Assist Developers and Support Managers*. In ICSM '06: Proceedings of the 22nd IEEE International Conference on Software Maintenance, pages 339–342, Washington, DC, USA, 2006. IEEE Computer Society. 42, 204, 320
- [Hassine 2005] Jameleddine Hassine, Juergen Rilling, Jacqueline Hewitt and Rachida Dssouli. *Change Impact Analysis for Requirement Evolution Using Use Case Maps*. In Proceedings of the Eighth International Workshop on Principles of Software Evolution, IWPSE '05, pages 81–90, Washington, DC, USA, 2005. IEEE Computer Society. 43, 44

- [Hattori 2012] LilePalma Hattori, Michele Lanza and Romain Robbes. *Refining code ownership with synchronous changes*. Empirical Software Engineering, vol. 17, no. 4-5, pages 467–499, 2012. 164, 306
- [He 2007] Jun He, Brian Butler and William King. *Team Cognition: Development and Evolution in Software Project Teams*. Journal of Management Information Systems, vol. 24, no. 2, pages 261–292, October 2007. 148, 149, 155, 156, 158
- [Healey 2012] Christopher G. Healey and James T. Enns. *Attention and Visual Memory in Visualization and Computer Graphics*. IEEE Transactions on Visualization and Computer Graphics, vol. 18, no. 7, pages 1170–1188, 2012. 49
- [Heimerl 2012] Florian Heimerl, Steffen Koch, Harald Bosch and Thomas Ertl. *Visual Classifier Training for Text Document Retrieval*. IEEE Transactions on Visualization and Computer Graphics, vol. 18, no. 12, pages 2839–2848, 2012. 48
- [Heitlager 2007] Ilja Heitlager, Tobias Kuipers and Joost Visser. *A Practical Model for Measuring Maintainability*. In 6th International Conference on the Quality of Information and Communications Technology, 2007. QUATIC 2007., pages 30–39, 2007. 41
- [Heller 2011] Brandon Heller, Eli Marschner, Evan Rosenfeld and Jeffrey Heer. *Visualizing collaboration and influence in the open-source software community*. In Proceedings of the 8th Working Conference on Mining Software Repositories, MSR '11, pages 223–226, New York, NY, USA, 2011. ACM. 172
- [Helminen 2010] Juha Helminen and Lauri Malmi. *Type-a program visualization and programming exercise tool for Python*. In Proceedings of the 5th international symposium on Software visualization, SOFTVIS '10, pages 153–162, New York, NY, USA, 2010. ACM. 305
- [Hemerly 2013] Jess Hemerly. *Public Policy Considerations for Data-Driven Innovation*. IEEE Computer, vol. 46, no. 6, pages 25–31, 2013. 6
- [Herbsleb 2001a] James D. Herbsleb, Audris Mockus, Thomas A. Finholt and Rebecca E. Grinter. *An Empirical Study of Global Software Development: Distance and Speed*. In Proceedings of the 23rd International Conference on Software Engineering, ICSE '01, pages 81–90, Washington, DC, USA, 2001. IEEE Computer Society. 24, 150

- [Herbsleb 2001b] James D. Herbsleb and Deependra Moitra. *Global software development*. IEEE Software, vol. 18, no. 2, pages 16–20, Mar 2001. 23, 147
- [Herbsleb 2003] James D. Herbsleb and Audris Mockus. *An Empirical Study of Speed and Communication in Globally Distributed Software Development*. IEEE Transactions in Software Engineering, vol. 29, no. 6, pages 481–494, June 2003. 23, 150, 151
- [Herman 2000] Ivan Herman, Guy Melançon and M. Scott Marshall. *Graph Visualization and Navigation in Information Visualization: A Survey*. IEEE Transactions on Visualization and Computer Graphics, vol. 6, no. 1, pages 24–43, January 2000. 59
- [Hermans 2013] Felienne Hermans, Ben Sedee, Martin Pinzger and Arie van Deursen. *Data clone detection and visualization in spreadsheets*. In Proceedings of the 2013 International Conference on Software Engineering, ICSE '13, pages 292–301, Piscataway, NJ, USA, 2013. IEEE Press. 306
- [Heuer 1999] Richards J. Heuer. *Psychology of intelligence analysis*. United States Government Printing, November 1999. 202
- [Hindle 2007] Abram Hindle, Zhen Ming Jiang, Walid Koleilat, Michael W. Godfrey and Richard C. Holt. *YARN: Animating Software Evolution*. In 4th IEEE International Workshop on Visualizing Software for Understanding and Analysis, 2007. VISSOFT 2007., pages 129–136, 2007. XIV, 134, 136, 144, 306
- [Hitz 1995] Martin Hitz and Behzad Montazeri. *Measuring Coupling and Cohesion In Object-Oriented Systems*. Symposium on Applied Corporate Computing, 1995. 44
- [Hochheiser 2004] Harry Hochheiser and Ben Shneiderman. *Dynamic query tools for time series data sets: timebox widgets for interactive exploration*. Information Visualization, vol. 3, no. 1, pages 1–18, 2004. 55
- [Hollender 2010] Nina Hollender, Cristian Hofmann, Michael Deneke and Bernhard Schmitz. *Integrating cognitive load theory and concepts of human computer interaction*. Computers in Human Behavior, vol. 26, no. 6, pages 1278–1288, November 2010. 49

- [Holmes 2007] Reid Holmes and Robert J. Walker. *Task-specific source code dependency investigation*. In 4th IEEE International Workshop on Visualizing Software for Understanding and Analysis, 2007. VISSOFT 2007., pages 100–107, 2007. 306
- [Holten 2007] Danny Holten, Bas Cornelissen and Jarke J. van Wijk. *Trace Visualization Using Hierarchical Edge Bundles and Massive Sequence Views*. In 4th IEEE International Workshop on Visualizing Software for Understanding and Analysis, 2007. VISSOFT 2007., pages 47–54, 2007. XIII, 129, 144, 219, 303, 329
- [Hyun 2009] Jeong Dong Hyun, Caroline Ziemkiewicz, Brian Fisher, William Ribarsky and Remco Chang. *iPCA: An Interactive System for PCA-based Visual Analytics*. Computer Graphics Forum, vol. 28, no. 3, pages 767 – 774, 2009. 48
- [Inselberg 1985] Alfred Inselberg. *The plane with parallel coordinates*. The Visual Computer, vol. 1, no. 2, pages 69–91, 1985. 60
- [Inselberg 2009] Alfred Inselberg. *Parallel coordinates: Visual multidimensional geometry and its applications*. Springer-Verlag New York, Inc., Secaucus, NJ, USA, 2009. 60
- [Institute 2011] McKinsey Global Institute. *Big data: The next frontier for innovation, competition, and productivity*. Rapport technique, McKinsey & Company, 2011. 64
- [Isenberg 2009] Petra Isenberg and Danyel Fisher. *Collaborative Brushing and Linking for Co-located Visual Analytics of Document Collections*. Computer Graphics Forum, vol. 28, no. 3, pages 1031–1038, 2009. 49
- [Isenberg 2012] Petra Isenberg, Danyel Fisher, Sharoda A. Paul, Meredith Ringel Morris, Kori Inkpen and Mary Czerwinski. *Co-Located Collaborative Visual Analytics around a Tabletop Display*. IEEE Transactions on Visualization and Computer Graphics, vol. 18, no. 5, pages 689 –702, may 2012. 49
- [Ishio 2012] Takashi Ishio, Shogo Etsuda and Katsuro Inoue. *A lightweight visualization of interprocedural data-flow paths for source code reading*. In IEEE 20th International Conference on Program Comprehension (ICPC), 2012, pages 37–46, 2012. 305
- [Islam 2010] Syed S. Islam, Jens Krinke and David Binkley. *Dependence cluster visualization*. In Proceedings of the 5th international

- symposium on Software visualization, SOFTVIS '10, pages 93–102, New York, NY, USA, 2010. ACM. 306
- [ISO 2014] *Systems and software engineering-Software life cycle processes*, December 2014. 20
- [Jackson 2000] Daniel Jackson and Martin Rinard. *Software Analysis: A Roadmap*. In Proceedings of the Conference on The Future of Software Engineering, ICSE '00, pages 133–145, New York, NY, USA, 2000. ACM. 43
- [Javed 2013] Waqas Javed and Niklas Elmqvist. *Stack Zooming for Multifocus Interaction in Skewed-Aspect Visual Spaces*. IEEE Transactions on Visualization and Computer Graphics, vol. 19, no. 8, pages 1362–1374, 2013. 49
- [Jedlitschka 2009] Andreas Jedlitschka. *An empirical model of software managers' information needs for software engineering technology selection: a framework to support experimentally-based software engineering technology selection*. PhD thesis, 2009. 37
- [Jensen 2003] Matt Jensen. *Visualizing Complex Semantic Timelines*. NewsBlip Technical Report NBTR2003-001, 2003. 54
- [Jermakovics 2011] Andrejs Jermakovics, Alberto Sillitti and Giancarlo Succi. *Mining and visualizing developer networks from version control systems*. In Proceedings of the 4th International Workshop on Cooperative and Human Aspects of Software Engineering, CHASE '11, pages 24–31, New York, NY, USA, 2011. ACM. XV, 171, 172, 174, 238, 306, 341
- [Jiménez 2009] Miguel Jiménez, Mario Piattini and Aurora Vizcaíno. *Challenges and Improvements in Distributed Software Development: A Systematic Review*. Advances in Software Engineering, vol. 2009, 2009. 23, 38
- [Johnson 1991] Brian Johnson and Ben Shneiderman. *Tree-Maps: a space-filling approach to the visualization of hierarchical information structures*. In VIS '91: Proceedings of the 2nd conference on Visualization '91, pages 284–291, Los Alamitos, CA, USA, 1991. IEEE Computer Society Press. 9, 47, 52, 56, 116, 311
- [Kagdi 2007a] Huzefa Kagdi, Michael L. Collard and Jonathan I. Maletic. *A survey and taxonomy of approaches for mining software repositories*

- in the context of software evolution*. Journal of Software Maintenance and Evolution: Research and Practice, vol. 19, no. 2, pages 77–131, 2007. 8, 42, 43, 196, 204, 295, 313, 320
- [Kagdi 2007b] Huzefa Kagdi and Jonathan I. Maletic. *Onion Graphs for Focus+Context Views of UML Class Diagrams*. In 4th IEEE International Workshop on Visualizing Software for Understanding and Analysis, 2007. VISSOFT 2007., pages 80–87, 2007. 42, 305
- [Kamiya 2002] Toshihiro Kamiya, Shinji Kusumoto and Katsuro Inoue. *CCFinder: a multilinguistic token-based code clone detection system for large scale source code*. IEEE Transactions on Software Engineering, vol. 28, no. 7, pages 654–670, Jul 2002. 44
- [Kan 2002] Stephen H. Kan. Metrics and models in software quality engineering. Addison-Wesley Longman Publishing Co., Inc., Boston, MA, USA, 2nd édition, 2002. 154
- [Karolak 1999] Dale W. Karolak. Global software development: Managing virtual teams and environments. IEEE Computer Society Press, Los Alamitos, CA, USA, 1st édition, 1999. 24
- [Karran 2013] Benjamin Karran, Jonas Trümper and Jürgen Döllner. *SYNCTRACE: Visual thread-interplay analysis*. In First IEEE Working Conference on Software Visualization (VISSOFT), 2013, pages 1–10, 2013. 305
- [Kasprzyka 2013] Joseph R. Kasprzyka, Shanthi Nataraj, Patrick M. Reeda and Robert J. Lempert. *Many objective robust decision making for complex environmental systems undergoing change*. Environmental Modelling and Software, vol. 42, no. 0, pages 55 – 71, 2013. 48
- [Kazman 1996] Rick Kazman, Gregory Abowd, Len Bass and Paul Clements. *Scenario-based analysis of software architecture*. IEEE Software, vol. 13, no. 6, pages 47–55, Nov 1996. 112
- [Keim 2006] Daniel A. Keim, Florian Mansmann, Jörn Schneidewind and Hartmut Ziegler. *Challenges in Visual Data Analysis*. In IV '06, Proceedings of the conference on Information Visualization, pages 9–16, Washington, DC, USA, 2006. IEEE Computer Society. 9, 47, 198, 311
- [Keim 2008a] Daniel Keim, Gennady Andrienko, Jean-Daniel Fekete, Carsten Görg, Jörn Kohlhammer and Guy Melancon. *Visual Analytics:*

- Definition, Process, and Challenges*. In Andreas Kerren, John T. Stasko, Jean-Daniel Fekete and Chris North, editeurs, Information Visualization, volume 4950 of *Lecture Notes in Computer Science*, pages 154–175. Springer Berlin Heidelberg, 2008. 47
- [Keim 2008b] Daniel A. Keim, Florian Mansmann, Jörn Schneidewind, Jim Thomas and Hartmut Ziegler. Visual data mining, chapitre Visual Analytics: Scope and Challenges, pages 76–90. Springer-Verlag, Berlin, Heidelberg, 2008. 198
- [Keivanloo 2011] Iman Keivanloo, Christopher Forbes, Juergen Rilling and Philippe Charland. *Towards Sharing Source Code Facts Using Linked Data*. In Proceedings of the 3rd International Workshop on Search-Driven Development: Users, Infrastructure, Tools, and Evaluation, SUITE '11, pages 25–28, New York, NY, USA, 2011. ACM. 43
- [Kelley 2013] Sean Kelley, Edward Aftandilian, Connor Gramazio, Nathan Ricci, Sara L. Su and Samuel Z. Guyer. *Heapviz: Interactive heap visualization for program understanding and debugging*. Information Visualization, vol. 12, no. 2, pages 163–177, 04 2013. 305
- [Kemmis 2005] Stephen Kemmis and Robin McTaggart. The sage handbook of qualitative research (3rd ed.), chapitre Participatory Action Research: Communicative Action and the Public Sphere., pages 559–603. Sage Publications Ltd, 2005. 13, 315
- [Kendall 2012] Wesley Kendall, Jian Huang and Tom Peterka. *Geometric Quantification of Features in Large Flow Fields*. IEEE Computer Graphics and Applications, vol. 32, no. 4, pages 46–54, 2012. 48
- [Khan 2010] Mumtaz Muhammad Khan, Sulaiman Aziz Lodhi and Muhammad Abdul Majid Makk. *Measuring Team Implicit Coordination*. Australian Journal of Basic and Applied Sciences, vol. 4, no. 6, pages 1211–1136, 2010. 151
- [Khan 2012] Taimur Khan, Henning Barthel, Achim Ebert and Peter Liggesmeyer. *Visualization and Evolution of Software Architectures*. In Christoph Garth, Ariane Middel and Hans Hagen, editeurs, Visualization of Large and Unstructured Data Sets: Applications in Geospatial Planning, Modeling and Engineering - Proceedings of IRTG 1131 Workshop 2011, volume 27 of *OpenAccess Series in Informatics (OASICs)*, pages 25–42, Dagstuhl, Germany, 2012. Schloss Dagstuhl–Leibniz-Zentrum fuer Informatik. 113

- [Kiczales 1997] Gregor Kiczales, John Lamping, Anurag Mendhekar, Chris Maeda, Cristina Lopes, Jean-Marc Loingtier and John Irwin. *Aspect-oriented programming*. In Mehmet Aksit and Satoshi Matsuoka, editors, ECOOP'97 - Object-Oriented Programming, volume 1241 of *Lecture Notes in Computer Science*, pages 220–242. Springer Berlin Heidelberg, 1997. 91
- [Kiekel 2011] Preston A . Kiekel and Nancy J . Cooke. Handbook of human factors in web design, second edition, chapitre Human Factor Aspects of Team Cognition, pages 107 – 123. CRC Press, 2011. 148, 149, 156
- [Kienle 2007] Holger M. Kienle and Hausi A. Müller. *Requirements of Software Visualization Tools: A Literature Survey*. In 4th IEEE International Workshop on Visualizing Software for Understanding and Analysis, 2007. VISSOFT 2007., pages 2–9, 2007. 303
- [Kilpi 1997] Tapani Kilpi. *Choosing a SCM-tool: a framework and evaluation*. In Eighth Conference on Software Engineering Environments, pages 164–172, 1997. 33
- [Kim 2006] Sunghun Kim, Kai Pan and Jr. Emmet James Whitehead. *Micro Pattern Evolution*. In Proceedings of the 2006 International Workshop on Mining Software Repositories, MSR '06, pages 40–46, New York, NY, USA, 2006. ACM. 44
- [Kim 2011] Miryung Kim. *An Exploratory Study of Awareness Interests About Software Modifications*. In Proceedings of the 4th International Workshop on Cooperative and Human Aspects of Software Engineering, CHASE '11, pages 80–83, New York, NY, USA, 2011. ACM. 38, 41
- [Kim 2012] Jinah Kim and Jinah Park. *Visualizing Marine Environmental Changes to the Saemangeum Coast*. IEEE Computer Graphics and Applications, vol. 32, no. 6, pages 82–87, 2012. 48
- [Kirsch 1996] Laurie J. Kirsch. *The Management of Complex Tasks in Organizations: Controlling the Systems Development Process*. Organization Science, vol. 7, no. 1, pages 1–21, 1996. 154
- [Kitchenham 1989] Barbara A. Kitchenham and John G. Walker. *A quantitative approach to monitoring software development*. Software Engineering Journal, vol. 4, no. 1, pages 2–13, Jan 1989. 154

- [Klimoski 1994] Richard Klimoski and Susan Mohammed. *Team mental model: construct or metaphor?* Journal of Management, vol. 20, no. 2, pages 403 – 437, 1994. A Special Issue of The Journal of Management. 148, 155, 156
- [Ko 2007] Andrew J. Ko, Robert DeLine and Gina Venolia. *Information Needs in Collocated Software Development Teams*. In Proceedings of the 29th International Conference on Software Engineering, ICSE '07, pages 344–353, Washington, DC, USA, 2007. IEEE Computer Society. 25, 38, 40
- [Ko 2012] Sungahn Ko, Ross Maciejewski, Yun Jang and David S. Ebert. *MarketAnalyzer: An Interactive Visual Analytics System for Analyzing Competitive Advantage Using Point of Sale Data*. Computer Graphics Forum, vol. 31, no. 3pt3, pages 1245–1254, 2012. 48
- [Koch 2011] Steffen Koch, Harald Bosch, Mark Giereth and Thomas Ertl. *Iterative Integration of Visual Insights during Scalable Patent Search and Analysis*. IEEE Transactions on Visualization and Computer Graphics, vol. 17, no. 5, pages 557 –569, may 2011. 48
- [Kohlhammer 2012] Jörn Kohlhammer, Kawa Nazemi, Tobias Ruppert and Dirk Burkhardt. *Toward Visualization in Policy Modeling*. IEEE Computer Graphics and Applications, vol. 32, no. 5, pages 84–89, 2012. 48
- [Koike 1993] Hideki Koike. *The Role of Another Spatial Dimension in Software Visualization*. ACM Transactions in Information Systems, vol. 11, no. 3, pages 266–286, July 1993. 246, 248, 250
- [Koike 1997] Hideki Koike and Hui-Chu Chu. *VRCS: Integrating Version Control and Module Management using Interactive 3D graphics*. In Proceedings of the 1997 IEEE Symposium on Visual Languages (VL '97), page 168, Washington, DC, USA, 1997. IEEE Computer Society. XVII, 246, 248, 250
- [Koschke 2003] Rainer Koschke. *Software visualization in software maintenance, reverse engineering, and re-engineering: a research survey*. Journal of Software Maintenance and Evolution: Research and Practice, vol. 15, no. 2, pages 87–109, 2003. 11, 184, 313
- [Kotlarsky 2008] Julia Kotlarsky, Paul C. van Fenema and Leslie P. Willcocks. *Developing a knowledge-based perspective on coordination: The case of*

- global software projects*. Information and Management, vol. 45, no. 2, pages 96 – 108, 2008. 151
- [Kraut 1995] Robert E. Kraut and Lynn A. Streeter. *Coordination in Software Development*. Communications of the ACM, vol. 38, no. 3, pages 69–81, March 1995. 4, 151, 152, 153, 308
- [Krishnan 2013] Krish Krishnan. Data warehousing in the age of big data. The Morgan Kaufmann Series on Business Intelligence Series. Elsevier Science & Technology Books, 2013. 6
- [Kuhn 2010a] Adrian Kuhn, David Erni, Peter Loretan and Oscar Nierstrasz. *Software Cartography: thematic software visualization with consistent layout*. Journal of Software Maintenance and Evolution: Research and Practice, vol. 22, no. 3, pages 191–210, 2010. XIV, 138, 139, 306
- [Kuhn 2010b] Adrian Kuhn, David Erni and Oscar Nierstrasz. *Embedding spatial software visualization in the IDE: an exploratory study*. In Proceedings of the 5th international symposium on Software visualization, SOFTVIS '10, pages 113–122, New York, NY, USA, 2010. ACM. 139, 306
- [Kuhn 2012] Adrian Kuhn and Mirko Stocker. *CodeTimeline: Storytelling with versioning data*. In 34th International Conference on Software Engineering (ICSE), 2012, pages 1333–1336, 2012. XV, 166, 168, 306
- [Laguna 2003] Miguel A. Laguna, José M. Marqués and Francisco J. García-Peñalvo. *DocFlow: workflow based requirements elicitation*. Information and Software Technology, vol. 45, no. 6, pages 357 – 369, 2003. 4, 309
- [Lai 2003] Su-Ying Lai, Richard Heeks and Brian Nicholson. *Uncertainty and Coordination in Global Software Projects: A UK/India-Centred Case Study*. In Development informatics working paper series, numéro 17 de Development informatics working paper series. Manchester : Institute for Development Policy and Management, University of Manchester, 2003. 152, 153
- [Laird 2006] Linda M. Laird and M. Carol Brennan. Software measurement and estimation: A practical approach (quantitative software engineering series). Wiley-IEEE Computer Society Pr, 2006. 90
- [LaMantia 2008] Matthew J. LaMantia, Yuanfang Cai, Alan D. MacCormack and John Rusnak. *Analyzing the Evolution of Large-Scale Software*

- Systems Using Design Structure Matrices and Design Rule Theory: Two Exploratory Cases.* In Proceedings of the Seventh Working IEEE/IFIP Conference on Software Architecture (WICSA 2008), WICSA '08, pages 83–92, Washington, DC, USA, 2008. IEEE Computer Society. 44
- [Lamping 1995] John Lamping, Ramana Rao and Peter Pirolli. *A focus+context technique based on hyperbolic geometry for visualizing large hierarchies.* In CHI '95: Proceedings of the SIGCHI conference on Human factors in computing systems, pages 401–408, New York, NY, USA, 1995. ACM Press/Addison-Wesley Publishing Co. 57
- [Lanza 2001a] Michele Lanza. *The evolution matrix: recovering software evolution using software visualization techniques.* In IWPSE '01: Proceedings of the 4th International Workshop on Principles of Software Evolution, pages 37–42, New York, NY, USA, 2001. ACM Press. XIII, 125, 126, 144
- [Lanza 2001b] Michele Lanza and Stéphane Ducasse. *A Categorization of Classes Based on the Visualization of Their Internal Structure: The Class Blueprint.* SIGPLAN Notices, vol. 36, no. 11, pages 300–311, October 2001. XIII, 127, 128, 144
- [Lanza 2003] Michele Lanza and Stéphane Ducasse. *Polymetric Views-A Lightweight Visual Approach to Reverse Engineering.* IEEE Transactions in Software Engineering, vol. 29, no. 9, pages 782–795, September 2003. XIII, 126, 127, 144
- [Lanza 2005a] Michele Lanza, Stéphane Ducasse, Harald Gall and Marting Pinzger. *CodeCrawler - an information visualization tool for program comprehension.* In Proceedings 27th International Conference on Software Engineering, 2005. ICSE 2005., pages 672–673, May 2005. 125
- [Lanza 2005b] Michele Lanza, Radu Marinescu and Stéphane Ducasse. *Object-oriented metrics in practice - using software metrics to characterize, evaluate, and improve the design of object-oriented systems.* Springer-Verlag New York, Inc., Secaucus, NJ, USA, 2005. 41, 44, 89, 182, 196, 313
- [Lanza 2010] Michele Lanza, Lile Hattori and Anja Guzzi. *Supporting Collaboration Awareness with Real-Time Visualization of Development Activity.* In Proceedings of the 2010 14th European Conference on

- Software Maintenance and Reengineering, CSMR '10, pages 202–211, Washington, DC, USA, 2010. IEEE Computer Society. *XV*, 173, 174, 175
- [Laumer 2011] Sven Laumer, Christian Maier, Andreas Eckhardt and Tim Weitzel. *The trend is our friend: german IT personnel's perception of job-related factors before, during and after the economic downturn*. In Proceedings of the 49th SIGMIS annual conference on Computer personnel research, SIGMIS-CPR '11, pages 65–70, New York, NY, USA, 2011. ACM. *7*, 27
- [Laval 2009] Jannik Laval, Simon Denier, Stéphane Ducasse and Alexandre Bergel. *Identifying Cycle Causes with Enriched Dependency Structural Matrix*. In 16th Working Conference on Reverse Engineering, 2009. WCRE '09., pages 113–122, 2009. 304
- [LaValle 2010] Steve LaValle, Michael S. Hopkins, Eric Lesser, Rebecca Shockley and Nina Kruschwitz. *Analytics: The new path to value*. Mit Sloan Management Review, 2010. 6
- [Lee 2006] Bongshin Lee, Catherine Plaisant, Cynthia Sims Parr, Jean-Daniel Fekete and Nathalie Henry. *Task taxonomy for graph visualization*. In Proceedings of the 2006 AVI workshop on BEyond time and errors: novel evaluation methods for information visualization, BELIV '06, pages 1–5, New York, NY, USA, 2006. ACM. 60
- [Lee 2009] Sang-Yong Tom Lee, Hee-Woong Kim and Sumeet Gupta. *Measuring open source software success*. Omega: The International Journal of Management Science, vol. 37, no. 2, pages 426 – 438, 2009. 4, 5, 308, 309
- [Lee 2011] Teng-Yok Lee. *Data Triage and Visual Analytics for Scientific Visualization*. PhD thesis, The Ohio State University, 2011. 62
- [Lehman 1997] Meir M. Manny Lehman, Juan F. Ramil, Paul D. Wernick, Dewayne E. Perry and Wladyslaw M Turski. *Metrics and Laws of Software Evolution - The Nineties View*. In Proceedings of the 4th International Symposium on Software Metrics, METRICS '97, pages 20–, Washington, DC, USA, 1997. IEEE Computer Society. *5*, 30, 41, 310
- [Leinonen 2005] Piritta Leinonen, Sanna Järvelä and Päivi Häkkinen. *Conceptualizing the Awareness of Collaboration: A Qualitative Study*

- of a Global Virtual Team*. Computer Supported Cooperative Work, vol. 14, no. 4, pages 301–322, August 2005. 158
- [Lemieux 2011] Victoria L. Lemieux. *Visual Analytics: A New Way to Manage Data Deluge in E-Discovery*. Information Management Journal, vol. 45, no. 2, pages 38 – 40, 2011. 48
- [Leung 1994a] Ying K. Leung and Mark D. Apperley. *A review and taxonomy of distortion-oriented presentation techniques*. ACM Transactions in Computer-Human Interaction, vol. 1, no. 2, pages 126–160, June 1994. 9, 47, 119, 311
- [Leung 1994b] Ying K. Leung and Mark D. Apperley. *A review and taxonomy of distortion-oriented presentation techniques*. ACM Transactions in Computer Human Interaction, vol. 1, no. 2, pages 126–160, 1994. 51, 52, 62
- [Li 2012] Kaiming Li, Lei Guo, Carlos Faraco, Dajiang Zhu, Hanbo Chen, Yixuan Yuan, Jinglei Lv, Fan Deng, Xi Jiang, Tuo Zhang, Xintao Hu, Degang Zhang, L. Stephen Miller and Tianming Liu. *Visual analytics of brain networks*. NeuroImage, vol. 61, no. 1, pages 82 – 97, 2012. 48
- [Liebrock 2009] Daniel A. Quistand Lorie M. Liebrock. *Visualizing compiled executables for malware analysis*. In 6th International Workshop on Visualization for Cyber Security, 2009. VizSec 2009., pages 27–32, 2009. 305
- [Likert 1932] Rensis Likert. *A technique for the measurement of attitudes*. Archives of Psychology, vol. 22, no. 140, pages 1–55, 1932. 273
- [Limberger 2013] Daniel Limberger, Benjamin Wasty, Jonas Trümper and Jürgen Döllner. *Interactive software maps for web-based source code analysis*. In Proceedings of the 18th International Conference on 3D Web Technology, Web3D '13, pages 91–98, New York, NY, USA, 2013. ACM. 116, 306
- [Lin 2010] Shen Lin, François Taïani, Thomas C. Ormerod and Linden J. Ball. *Towards anomaly comprehension: using structural compression to navigate profiling call-trees*. In Proceedings of the 5th international symposium on Software visualization, SOFTVIS '10, pages 103–112, New York, NY, USA, 2010. ACM. 305
- [Lincke 2008] Rüdiger Lincke, Jonas Lundberg and Welf Löwe. *Comparing Software Metrics Tools*. In Proceedings of the 2008 International

- Symposium on Software Testing and Analysis, ISSTA '08, pages 131–142, New York, NY, USA, 2008. ACM. 43
- [Lintern 2003] Rob Lintern, Jeff Michaud, Margaret-Anne Storey and Wu Xiaomin. *Plugging-in visualization: experiences integrating a visualization tool with Eclipse*. In Proceedings of the 2003 ACM symposium on Software visualization, SoftVis '03, pages 47–ff, New York, NY, USA, 2003. ACM. 191
- [Livnat 2012] Yarden Livnat, Theresa-Marie Rhyne and Matthew H. Samore. *Epinome: A Visual-Analytics Workbench for Epidemiology Data*. Computer Graphics and Applications, IEEE, vol. 32, no. 2, pages 89–95, march-april 2012. 48
- [Llorá 2006] X. Llorá, K. Sastry, F. Alías, D. E. Goldberg and M. I. Welge. *Analyzing Active Interactive Genetic Algorithms Using Visual Analytics*. In GECCO '06, Proceedings of the 8th annual conference on Genetic and evolutionary computation, pages 1417–1418, New York, NY, USA, 2006. ACM. 9, 47, 311
- [Long 2009] Tran Van Long and Lars Linsen. *MultiClusterTree: Interactive Visual Exploration of Hierarchical Clusters in Multidimensional Multivariate Data*. Computer Graphics Forum, vol. 28, no. 3, pages 823–830, 2009. 60
- [Luhmann 1992] Niklas Luhmann. *What is Communication?* Communication Theory, vol. 2, no. 3, pages 251–259, 1992. 150
- [Lungu 2010] Mircea Lungu, Michele Lanza, Tudor Gîrba and Romain Robbes. *The Small Project Observatory: Visualizing software ecosystems*. Science of Computer Programming, vol. 75, no. 4, pages 264 – 275, 2010. 305
- [Luo 2012] Dongning Luo, Jing Yang, Milos Krstajic, William Ribarsky and Daniel A. Keim. *EventRiver: Visually Exploring Text Collections with Temporal References*. IEEE Transactions on Visualization and Computer Graphics, vol. 18, no. 1, pages 93 –105, jan. 2012. 48
- [Luo 2013] Yi Luo and Yanying Han. *Source Code Visualization in Linux Environment Based on Hierarchical Layout Algorithm*. Information Technology Journal, vol. 12, no. 8, pages 1522–1530, August 2013. 306

- [Maciejewski 2010] Ross Maciejewski, Travis Drake, Stephen Rudolph, Abish Malik and David S. Ebert. *Data Aggregation and Analysis for Cancer Statistics - A Visual Analytics Approach*. In 43rd Hawaii International Conference on System Sciences (HICSS), pages 1–5, jan. 2010. 48
- [Maciejewski 2011] Ross Maciejewski, Ryan Hafen, Stephen Rudolph, Stephen G. Larew, Michael A. Mitchell, William S. Cleveland and David S. Ebert. *Forecasting Hotspots-A Predictive Analytics Approach*. IEEE Transactions on Visualization and Computer Graphics, vol. 17, no. 4, pages 440–453, april 2011. 49
- [Mackinlay 1991] Jock D. Mackinlay, George G. Robertson and Stuart K. Card. *The perspective wall: detail and context smoothly integrated*. In CHI '91: Proceedings of the SIGCHI conference on Human factors in computing systems, pages 173–176, New York, NY, USA, 1991. ACM Press. 52, 54
- [MacMillan 2004] Jean MacMillan, Elliot E. Entin and Daniel Serfaty. Team cognition: Understanding the factors that drive process and performance, chapitre Communication overhead: The hidden cost of team cognition., pages 61–82. American Psychological Association, Washington, DC, US, 2004. 150, 151, 156, 157
- [Madhavi 2011] Karanam Madhavi and Akepogu Anand Rao. *A Framework for Visualizing Model-Driven Software Evolution-Its Evaluation*. International Journal of Software Engineering and Its Applications, vol. 5, pages 135–148, 2011. 303
- [Mahoney 2009] Mark Mahoney. *Software evolution and the moving picture metaphor*. SIGPLAN Notices, vol. 44, no. 10, pages 525–528, October 2009. 196
- [Mahyar 2012] Narges Mahyar, Ali Sarvghad and Melanie Tory. *Note-taking in co-located collaborative visual analytics: Analysis of an observational study*. Information Visualization, vol. 11, no. 3, pages 190–204, 07 2012. 49
- [Maletic 2002] Jonathan I. Maletic, Andrian Marcus and Michael L. Collard. *A Task Oriented View of Software Visualization*. IEEE Workshop of Visualizing Software for Understanding and Analysis (VISSOFT), vol. 26, pages 32–40, 2002. 161, 183
- [Maletic 2004] Jonathan I. Maletic and Michael L. Collard. *Supporting source code difference analysis*. In Proceedings of the 20th IEEE International

- Conference on Software Maintenance, 2004., pages 210–219, Sept 2004.
44
- [Mane 2012] Ketan K. Mane, Chris Bizon, Charles Schmitt, Phillips Owen, Bruce Burchett, Ricardo Pietrobon and Kenneth Gersing. *VisualDecisionLinc: A visual analytics approach for comparative effectiveness-based clinical decision support in psychiatry*. Journal of Biomedical Informatics, vol. 45, no. 1, pages 101 – 106, 2012. 10, 48, 312
- [Maoz 2011] Shahar Maoz and David Harel. *On tracing reactive systems*. Software & Systems Modeling, vol. 10, no. 4, pages 447 – 468, 2011. 305
- [McCabe 1976] Thomas J. McCabe. *A Complexity Measure*. IEEE Transactions on Software Engineering, vol. 2, no. 4, pages 308–320, 1976. 41
- [Mens 2001] Tom Mens and Serge Demeyer. *Future trends in software evolution metrics*. In Proceedings of the 4th International Workshop on Principles of Software Evolution, IWPSE '01, pages 83–86, New York, NY, USA, 2001. ACM. 41, 44
- [Mens 2008] Tom Mens and Serge Demeyer, editors. *Software evolution*. Springer, 2008. 7, 196, 313
- [Merriam-Webster Online 2009] Merriam-Webster Online. *Merriam-Webster Online Dictionary*, 2009. 25
- [Meyer 2012] Joerg Meyer, E. Wes Bethel, Jennifer L. Horsman, Susan S. Hubbard, Harinarayan Krishnan, Alexandru Romosan, Elizabeth H. Keating, Laura Monroe, Richard Strelitz, Phil Moore, Glenn Taylor, Ben Torkian, Timothy C. Johnson and Ian Gorton. *Visual Data Analysis as an Integral Part of Environmental Management*. IEEE Transactions on Visualization and Computer Graphics, vol. 18, no. 12, pages 2088–2094, 2012. 49
- [Meyers 2007] Timothy M. Meyers and David Binkley. *An Empirical Study of Slice-based Cohesion and Coupling Metrics*. ACM Transactions in Software Engineering Methodologies, vol. 17, no. 1, pages 2:1–2:27, December 2007. 44
- [Migut 2011] Malgorzata Migut, Jan van Gemert and Marcel Worring. *Interactive decision making using dissimilarity to visually represented*

- prototypes*. In 2011 IEEE Conference on Visual Analytics Science and Technology (VAST), pages 141–149, oct. 2011. 9, 311
- [Migut 2012] Malgorzata Migut and Marcel Worring. *Visual exploration of classification models for various data types in risk assessment*. Information Visualization, vol. 11, no. 3, pages 237–251, 07 2012. 49
- [Minelli 2013] Roberto Minelli and Michele Lanza. *Software Analytics for Mobile Applications—Insights amp;amp; Lessons Learned*. In 17th European Conference on Software Maintenance and Reengineering (CSMR), 2013, pages 144–153, 2013. 303
- [Mintzberg 1991] Henry Mintzberg. *The Effective Organization: Forces and Forms*. Mit Sloan Management Review, January, 15 1991. 24
- [Misra 2013] Sanjay Misra, Ricardo Colomo-Palacios, Tolga Pusatli and Pedro Soto-Acosta. *A discussion on the role of people in global software development*. Tehnicki vjesnik / Technical Gazette, vol. 20, no. 3, pages 525 – 531, 2013. 24, 38
- [Mockus 2001] Audris Mockus and David M. Weiss. *Globalization by Chunking: A Quantitative Approach*. IEEE Software, vol. 18, no. 2, pages 30–37, March 2001. 24, 149, 150
- [Moons 2009] Jan Moons and Carlos De Backer. *Rationale Behind the Design of the EduVisor Software Visualization Component*. Electronic Notes in Theoretical Computer Science, vol. 224, no. 0, pages 57 – 65, 2009. 303
- [Moreta 2007] Sergio Moreta and Alexandru Telea. *Visualizing Dynamic Memory Allocations*. In 4th IEEE International Workshop on Visualizing Software for Understanding and Analysis, 2007. VISSOFT 2007., pages 31–38, 2007. 305
- [Morisaki 2007] Shuji Morisaki, Akito Monden, Tomoko Matsumura, Haruaki Tamada and Ken ichi Matsumoto. *Defect Data Analysis Based on Extended Association Rule Mining*. In Proceedings of the Fourth International Workshop on Mining Software Repositories, MSR '07, pages 3–, Washington, DC, USA, 2007. IEEE Computer Society. 43
- [Morisio 2002] Maurizio Morisio, Michel Ezran and Colin Tully. *Success and failure factors in software reuse*. IEEE Transactions on Software Engineering, vol. 28, no. 4, pages 340–357, Apr 2002. 4, 308

- [Morris 2003] Steven A. Morris, G. Yen, Zheng Wu and Benyam Asnake. *Time line visualization of research fronts*. Journal of the American Society for Information Science and Technology, vol. 54, no. 5, pages 413–422, 2003. 55
- [Munch 2004] Jurgen Munch and Jens Heidrich. *Software project control centers: concepts and approaches*. Journal of Systems and Software, vol. 70, no. 1,2, pages 3–19, 2004. 10, 312
- [Murphy-Hill 2010] Emerson Murphy-Hill and Andrew P. Black. *An interactive ambient visualization for code smells*. In Proceedings of the 5th international symposium on Software visualization, SOFTVIS '10, pages 5–14, New York, NY, USA, 2010. ACM. 305
- [Murphy-Hill 2013] Emerson Murphy-Hill, Titus Barik and Andrew P. Black. *Interactive ambient visualizations for soft advice*. Information Visualization, vol. 12, no. 2, pages 107–132, 04 2013. 305
- [Murphy 1997] Gail C. Murphy and David Notkin. *Reengineering with Reflection Models: A Case Study*. IEEE Computer, vol. 30, no. 8, pages 29–36, 1997. 7, 27
- [Myers 2010] Colin Myers and David Duke. *A map of the heap: revealing design abstractions in runtime structures*. In Proceedings of the 5th international symposium on Software visualization, SOFTVIS '10, pages 63–72, New York, NY, USA, 2010. ACM. 305
- [Myller 2009] Niko Myller, Roman Bednarik, Erkki Sutinen and Mordechai Ben-Ari. *Extending the Engagement Taxonomy: Software Visualization and Collaborative Learning*. Transactions on Computing Education, vol. 9, no. 1, pages 7:1–7:27, March 2009. 303
- [Nam 2013] Julia EunJu Nam and Klaus Mueller. *TripAdvisor \hat{N} -D: A TourismInspired HighDimensional Space Exploration Framework with Overview and Detail*. IEEE Transactions on Visualization and Computer Graphics, vol. 19, no. 2, pages 291–305, 2013. 49
- [Nasir 2011] Mohd Hairul Nizam Nasir and Shamsul Sahibuddin. *Critical success factors for software projects: A comparative study*. Scientific Research and Essays, vol. 6, no. 10, pages 2174–2186, May 2011. 5, 309
- [Nestor 2008] Daren Nestor, Steffen Thiel, Goetz Botterweck, Ciarán Cawley and Patrick Healy. *Applying visualisation techniques in software*

- product lines*. In Proceedings of the 4th ACM symposium on Software visualization, SoftVis '08, pages 175–184, New York, NY, USA, 2008. ACM. 306
- [Neu 2011] Sylvie Neu, Michele Lanza, Lile Hattori and Marco D'Ambros. *Telling stories about GNOME with Complicity*. In 6th IEEE International Workshop on Visualizing Software for Understanding and Analysis (VISSOFT), 2011, pages 1–8, 2011. 305
- [Niazi 2006] Mahmood Niazi, David Wilson and Didar Zowghi. *Critical success factors for software process improvement implementation: an empirical study*. Software Process: Improvement and Practice, vol. 11, no. 2, pages 193–211, 2006. 5, 309
- [Nielsen 14] Jakob Nielsen and Don Norman. *The Definition of User Experience*. Website, 3 14. 271
- [Noda 2009] Kunihiro Noda, Takashi Kobayashi, Kiyoshi Agusa and Shinichiro Yamamoto. *Sequence Diagram Slicing*. In Software Engineering Conference, 2009. APSEC '09. Asia-Pacific, pages 291–298, 2009. 305
- [North 2000] Chris North and Ben Shneiderman. *Snap-together visualization: can users construct and operate coordinated visualizations*. International Journal of Human-Computer Studies, vol. 53, no. 5, pages 715 – 739, 2000. 10, 47, 198, 200, 311
- [Novais 2011] Renato L. Novais, Caio A. N. Lima, Glauco de F. Carneiro, Paulo R. M. S. Júnior and Manoel Mendonca. *An interactive differential and temporal approach to visually analyze software evolution*. In 6th IEEE International Workshop on Visualizing Software for Understanding and Analysis (VISSOFT), 2011, pages 1–4, 2011. 306
- [Novais 2012] Renato Lima Novais, Camila Nunes, Caio Lima, Elder Cirilo, Francisco Dantas, Alessandro Garcia and Manoel Mendonca. *On the proactive and interactive visualization for feature evolution comprehension: An industrial investigation*. In 34th International Conference on Software Engineering (ICSE), 2012, pages 1044–1053, 2012. 306
- [Novais 2013] Renato Lima Novais, André Torres, Thiago Souto Mendes, Manoel Mendonca and Nico Zazworka. *Software evolution*

- visualization: A systematic mapping study*. Information and Software Technology, no. 0, pages –, 2013. 110, 303
- [Oeltze 2011] Steffen Oeltze, Wolfgang Freiler, Reyk Hillert, Helmut Doleisch, Bernhard Preim and Walter Schubert. *Interactive, Graph-based Visual Analysis of High-dimensional, Multi-parameter Fluorescence Microscopy Data in Toponomics*. IEEE Transactions on Visualization and Computer Graphics, vol. 17, no. 12, pages 1882–1891, dec. 2011. 48
- [Ogawa 2009] Michael Ogawa and Kwan-Liu Ma. *code_swarm: A Design Study in Organic Software Visualization*. IEEE Transactions on Visualization and Computer Graphics, vol. 15, no. 6, pages 1097–1104, nov 2009. 5, 23, 303, 309
- [Ogawa 2010] Michael Ogawa and Kwan-Liu Ma. *Software evolution storylines*. In Proceedings of the 5th international symposium on Software visualization, SOFTVIS '10, pages 35–42, New York, NY, USA, 2010. ACM. 303
- [Olchi 1978] William G. Olchi. *The Transmission of Control Through Organizational Hierarchy*. Academy of Management Journal, vol. 2, no. 2, pages 173–192, June 1978. 154
- [Omer 2010] Itzhak Omer, Peter Bak and Tobias Schreck. *Using space-time visual analytic methods for exploring the dynamics of ethnic groups' residential patterns*. International Journal of Geographical Information Science, vol. 24, no. 10, pages 1481–1496, October 2010. 49
- [Omoronyia 2010] Inah Omoronyia, John Ferguson, Marc Roper and Murray Wood. *A review of awareness in distributed collaborative software engineering*. Software: Practice and Experience, vol. 40, no. 12, pages 1107–1133, 2010. 23, 38
- [Ooms 2012] Kristien Ooms, Gennady Andrienko, Natalia Andrienko, Philippe De Maeyer and Veerle Fack. *Analysing the spatial dimension of eye movement data using a visual analytic approach*. Expert Systems with Applications, vol. 39, no. 1, pages 1324 – 1332, 2012. 48
- [Owens 2011] Dawn Owens and Deepak Khazanchi. *Best Practices for Retaining Global IT Talent*. In System Sciences (HICSS), 2011 44th Hawaii International Conference on, pages 1–12, jan. 2011. 7, 27

- [Panas 2003] Thomas Panas, Rebecca Berrigan and John Grundy. *A 3D metaphor for software production visualization*. In Proceedings. Seventh International Conference on Information Visualization, 2003. IV 2003., pages 314–319, July 2003. 114, 143
- [Panas 2005] Thomas Panas, Rüdiger Lincke and Welf Löwe. *Online-configuration of Software Visualizations with Viz3D*. In Proceedings of the 2005 ACM Symposium on Software Visualization, SoftVis '05, pages 173–182, New York, NY, USA, 2005. ACM. 114, 143
- [Park 2009] Yunrim Park and Carlos Jensen. *Beyond pretty pictures: Examining the benefits of code visualization for Open Source newcomers*. In 5th IEEE International Workshop on Visualizing Software for Understanding and Analysis, 2009. VISSOFT 2009., pages 3–10, 2009. 303
- [Parnin 2007] Chris Parnin and Carsten Görg. *Design Guidelines for Ambient Software Visualization in the Workplace*. In 4th IEEE International Workshop on Visualizing Software for Understanding and Analysis, 2007. VISSOFT 2007., pages 18–25, 2007. 303
- [Parnin 2008] Chris Parnin, Carsten Görg and Ogechi Nnadi. *A catalogue of lightweight visualizations to support code smell inspection*. In Proceedings of the 4th ACM symposium on Software visualization, SoftVis '08, pages 77–86, New York, NY, USA, 2008. ACM. 303
- [Parnin 2010] Chris Parnin, Carsten Görg and Spencer Rugaber. *CodePad: interactive spaces for maintaining concentration in programming environments*. In Proceedings of the 5th international symposium on Software visualization, SOFTVIS '10, pages 15–24, New York, NY, USA, 2010. ACM. 303
- [Paul 1999] Raymond A. Paul, Toshiyasu L. Kunii, Yoshihisa Shinagawa and Muhammad F. Khan. *Software metrics knowledge and databases for project management*. IEEE Transactions on Knowledge and Data Engineering, vol. 11, no. 1, pages 255–264, jan/feb 1999. 10, 312
- [Pauw 2006] Wim De Pauw, Sophia Krasikov and John F. Morar. *Execution patterns for visualizing web services*. In Proceedings of the 2006 ACM symposium on Software visualization, SoftVis '06, pages 37–45, New York, NY, USA, 2006. ACM. 44

- [Pauw 2009] Wim De Pauw and Henrique Andrade. *Visualizing large-scale streaming applications*. Information Visualization, vol. 8, no. 2, pages 87–106, 2009. 305
- [Pauw 2010] Wim De Pauw and Steve Heisig. *Zinsight: a visual and analytic environment for exploring large event traces*. In Proceedings of the 5th international symposium on Software visualization, SOFTVIS '10, pages 143–152, New York, NY, USA, 2010. ACM. 305
- [Pauw 2013] Wim De Pauw, Joel Wolf and Andrey Balmin. *Visualizing jobs with shared resources in distributed environments*. In First IEEE Working Conference on Software Visualization (VISSOFT), 2013, pages 1–10, 2013. 305
- [Pauwels 2010] Stefan L. Pauwels, Christian Hübscher, Javier A. Bargas-Avila and Klaus Opwis. *Building an interaction design pattern language: A case study*. Computer in Human Behaviour, vol. 26, no. 3, pages 452–463, May 2010. 63
- [Pavlo 2006] Andrew Pavlo, Christopher Homan and Jonathan Schull. *A parent-centered radial layout algorithm for interactive graph visualization and animation*. ArXiv Computer Science e-prints, jun 2006. 52, 58
- [Peck 2011] R. Peck, C. Olsen and J.L. Devore. Introduction to statistics and data analysis. Available Titles Aplia Series. Cengage Learning, 2011. 9, 47, 311
- [Peláez 2008] Rafael Peláez, Roberto Therón, Carlos Armando García, José Luis López-Pérez and Manuel Medarde. *Design of New Chemoinformatic Tools for the Analysis of Virtual Screening Studies: Application to Tubulin Inhibitors*. In 2nd International Workshop on Practical Applications of Computational Biology and Bioinformatics, IWPACBB 2008, Salamanca, Spain, 22th-24th October 2008, pages 189–196, 2008. 14, 49
- [Pelekis 2012] Nikos Pelekis, Gennady Andrienko, Natalia Andrienko, Ioannis Kopanakis, Gerasimos Marketos and Yannis Theodoridis. *Visually exploring movement data via similarity-based analysis*. Journal of Intelligent Information Systems, vol. 38, pages 343–391, 2012. 10.1007/s10844-011-0159-2. 48, 49
- [Perer 2011] A. Perer, I. Guy, E. Uziel, I. Ronen and M. Jacovi. *Visual social network analytics for relationship discovery in the enterprise*. In 2011

- IEEE Conference on Visual Analytics Science and Technology (VAST), pages 71–79, oct. 2011. 9, 311
- [Perer 2013] Adam Perer, Ido Guy, Erel Uziel, Inbal Ronen and Michal Jacovi. *The Longitudinal Use of SaNDVis: Visual Social Network Analytics in the Enterprise*. IEEE Transactions on Visualization and Computer Graphics, vol. 19, no. 7, pages 1095–1108, 2013. 49
- [Pérez 2013] Carlos Armando García Pérez. *Análítica visual aplicada al diseño de nuevos fármacos*. PhD thesis, University of Salamanca, 2013. 14, 49
- [PerforceSoftware 2014] PerforceSoftware. *Introducing Perforce*, 12 2014. XVII, 246, 249, 250
- [Petersen 2008] Kai Petersen, Robert Feldt, Shahid Mujtaba and Michael Mattsson. *Systematic mapping studies in software engineering*. In Proceedings of the 12th International Conference on Evaluation and Assessment in Software Engineering, EASE'08, pages 68–77, Swinton, UK, UK, 2008. British Computer Society. 71
- [Peterson 2012] Elena S. Peterson, Lee Ann McCue, Alexandra C. Schrimpe-Rutledge, Jeffrey L Jensen, Hyunjoo Walker, Markus A Kobold, Samantha R. Webb, Samuel H. Payne, Charles Ansong, Joshua N. Adkins, William R. Cannon and Bobbie-Jo M. Webb-Robertson. *VESPA: software to facilitate genomic annotation of prokaryotic organisms through integration of proteomic and transcriptomic data*. BMC Genomics, vol. 13, no. 1, page 131, 2012. 48
- [Petre 1998] Marian Petre, Alan F. Blackwell and Thomas R. G. Green. *Software visualization: Programming as a multi-media experience*, chapitre Cognitive Questions in Software Visualisation, pages 453–480. MIT Press, January 1998. 196
- [Petre 2010] Marian Petre. *Mental imagery and software visualization in high-performance software development teams*. Journal of Visual Languages & Computing, vol. 21, no. 3, pages 171 – 183, 2010. 303
- [Pileggi 2012] Hannah Pileggi, Charles D. Stolper, J. Michael Boyle, and John T. Stasko. *SnapShot: Visualization to Propel Ice Hockey Analytics*. IEEE Transactions on Visualization and Computer Graphics, vol. 18, no. 12, pages 2819–2828, 2012. 49

- [Pilgrim 2009] Jens Von Pilgrim, Kristian Duske and Paul McIntosh. *Eclipse GEF3D: Bringing 3D to existing 2D editors*. Information Visualization, vol. 8, no. 2, pages 107–119, Summer 2009. 303
- [Pinelle 2005] David Pinelle and Carl Gutwin. *A Groupware Design Framework for Loosely Coupled Workgroups*. In Proceedings of the Ninth Conference on European Conference on Computer Supported Cooperative Work, ECSCW'05, pages 65–82, New York, NY, USA, 2005. Springer-Verlag New York, Inc. 24
- [Pinzger 2005] Martin Pinzger, Harald Gall, Michael Fischer and Michele Lanza. *Visualizing Multiple Evolution Metrics*. In Proceedings of the 2005 ACM Symposium on Software Visualization, SoftVis '05, pages 67–75, New York, NY, USA, 2005. ACM. 182
- [Pirolli 2001] Peter Pirolli, Stuart K. Card and Mija M. Van Der Wege. *Visual information foraging in a focus + context visualization*. In Proceedings of the SIGCHI conference on Human factors in computing systems, CHI '01, pages 506–513, New York, NY, USA, 2001. ACM. 62
- [Plaisant 1998] Catherine Plaisant, Daniel Heller, Jia Li, Ben Shneiderman, Rich Mushlin and John Karat. *Visualizing medical records with LifeLines*. In CHI '98: CHI 98 conference summary on Human factors in computing systems, pages 28–29, New York, NY, USA, 1998. ACM. 52, 54
- [Ploeger 2008] Bas Ploeger and Carst Tankink. *Improving an interactive visualization of transition systems*. In Proceedings of the 4th ACM symposium on Software visualization, SoftVis '08, pages 115–124, New York, NY, USA, 2008. ACM. 304
- [PMI 2002] Project Management Institute PMI. Project manager competency development (pmcd) framework. Project Management Institute, Inc., 2002. 23
- [Pohl 2012] Margit Pohl, Michael Smuc, and Eva Mayr. *The User Puzzle-Explaining the Interaction with Visual Analytics Systems*. IEEE Transactions on Visualization and Computer Graphics, vol. 18, no. 12, pages 2908–2916, 2012. 49
- [Predonzani 1998] Paolo Predonzani, Giancarlo Succi and Tullio Vernazza. *Skill management in software engineering*. In Proceedings of the Thirteen International Conference and Symposium on Computer and Information Sciences, 1998. 38

- [Prikladnicki1 2003] Rafael Prikladnicki1, Jorge Luis Nicolas Audy and Roberto Evaristo. *Global software development in practice lessons learned*. Software Process: Improvement and Practice, vol. 8, no. 4, pages 267–281, 2003. 23, 24
- [Procaccino 2002] J. Drew Procaccino, June M. Verner, Scott P. Overmyer and Marvin E. Darter. *Case study: factors for early prediction of software development success*. Information & Software Technology, vol. 44, no. 1, pages 53–62, 2002. 4, 308
- [Proulx 2006] Pascale Proulx, Sumeet Tandon, Adam Bodnar, David Schroh, Robert Harper and William Wright. *Avian Flu Case Study with nSpace and GeoTime*. In 2006 IEEE Symposium On Visual Analytics Science And Technology, pages 27 –34, 31 2006-nov. 2 2006. 9, 311
- [Qualtrics, Inc. 2013] Qualtrics, Inc. *Qualtrics Web Survey Tool*, 2013. www.qualtrics.com. 178, 273
- [Quist 2011] Daniel A. Quist and Lorie M. Liebrock. *Reversing Compiled Executables for Malware Analysis via Visualization*. Information Visualization, vol. 10, no. 2, pages 117–126, 04 2011. 306
- [Ramesh 2006] Balasubramaniam Ramesh, Lan Cao, Kannan Mohan and Peng Xu. *Can Distributed Software Development Be Agile?* Communications of the ACM, vol. 49, no. 10, pages 41–46, October 2006. 150
- [Rao 1994] Ramana Rao and Stuart K. Card. *The table lens: merging graphical and symbolic representations in an interactive focus + context visualization for tabular information*. Proceedings of the SIGCHI conference on Human factors in computing systems: celebrating interdependence, pages 318–322, 1994. 52
- [Reiss 2005] Frederick Reiss and Joseph M. Hellerstein. *Data Triage: an adaptive architecture for load shedding in TelegraphCQ*. In Proceedings of the 21st International Conference on Data Engineering, 2005. ICDE 2005., pages 155–156, 2005. 62
- [Reiss 2009] Steven P. Reiss. *Visualizing the Java heap to detect memory problems*. In 5th IEEE International Workshop on Visualizing Software for Understanding and Analysis, 2009. VISSOFT 2009., pages 73–80, 2009. 305

- [Reiss 2010] Steven P. Reiss and Suman Karumuri. *Visualizing threads, transactions and tasks*. In Proceedings of the 9th ACM SIGPLAN-SIGSOFT Workshop on Program Analysis for Software Tools and Engineering, PASTE '10, pages 9–16, New York, NY, USA, 2010. ACM. 305
- [Reiss 2013] Steven P. Reiss and Alexander Tarvo. *Automatic categorization and visualization of lock behavior*. In First IEEE Working Conference on Software Visualization (VISSOFT), 2013, pages 1–10, 2013. 305
- [Reniers 2012] Dennie Reniers, Lucian Voinea, Ozan Ersoy and Alexandru Telea. *The Solid* toolset for software visual analytics of program structure and metrics comprehension: From research prototype to product*. Science of Computer Programming, 2012. 9, 49, 203, 306, 311, 317
- [Rilling 2007] Juergen Rilling, Wen Jun Meng, Fuzhi Chen and Philippe Charland. *Software Visualization - A Process Perspective*. In 4th IEEE International Workshop on Visualizing Software for Understanding and Analysis, 2007. VISSOFT 2007., pages 10–17, 2007. 303
- [Rios-Berrios 2012] Miguel Rios-Berrios, Puneet Sharma, Tak Yeon Lee, Rachel Schwartz and Ben Shneiderman. *TreeCovey: Coordinated dual treemap visualization for exploring the Recovery Act*. Government Information Quarterly, vol. 29, no. 2, pages 212 – 222, 2012. 48
- [Ripley 2007] Roger M. Ripley, Anita Sarma and Andre van der Hoek. *A Visualization for Software Project Awareness and Evolution*. In Visualizing Software for Understanding and Analysis, 2007. VISSOFT 2007. 4th IEEE International Workshop on, pages 137 –144, june 2007. XV, 167, 169, 306
- [Risi 2012] Michele Risi and Giuseppe Scanniello. *MetricAttitude: a visualization tool for the reverse engineering of object oriented software*. In Proceedings of the International Working Conference on Advanced Visual Interfaces, AVI '12, pages 449–456, New York, NY, USA, 2012. ACM. 305
- [Roberts 2007] Jonathan C. Roberts. *State of the Art: Coordinated Multiple Views in Exploratory Visualization*. In Coordinated and Multiple Views in Exploratory Visualization, 2007. CMV '07. Fifth International Conference on, pages 61 –71, july 2007. 47

- [Robertson 1991] George G. Robertson, Jock D. Mackinlay and Stuart K. Card. *Cone Trees: animated 3D visualizations of hierarchical information*. In CHI '91: Proceedings of the SIGCHI conference on Human factors in computing systems, pages 189–194, New York, NY, USA, 1991. ACM Press. 9, 47, 52, 57, 311
- [Robertson 2010] George G. Robertson, Trishul Chilimbi and Bongshin Lee. *AllocRay: memory allocation visualization for unmanaged languages*. In Proceedings of the 5th international symposium on Software visualization, SOFTVIS '10, pages 43–52, New York, NY, USA, 2010. ACM. 305
- [Robillard 2003] Martin P. Robillard and Gail C. Murphy. *Static Analysis to Support the Evolution of Exception Structure in Object-oriented Systems*. ACM Transactions on Software Engineering and Methodology, vol. 12, no. 2, pages 191–221, April 2003. 43, 44
- [Rodríguez 2004] Oscar M. Rodríguez, Ana I. Martínez, Aurora Vizcaíno, Jesús Favela and Mario Piattini. *Identifying Knowledge Management Needs in Software Maintenance Groups: A Qualitative Approach*. In Proceedings of the Fifth Mexican International Conference in Computer Science, ENC '04, pages 72–79, Washington, DC, USA, 2004. IEEE Computer Society. 38
- [Rook 1986] Paul Rook. *Controlling software projects*. Software Engineering Journal, vol. 1, no. 1, pages 7–, January 1986. 152, 153, 154
- [Rosen 2013] Paul Rosen. *A Visual Approach to Investigating Shared and Global Memory Behavior of CUDA Kernels*. Computer Graphics Forum, vol. 32, no. 3pt2, pages 161–170, 2013. 305
- [Roth 2012] Robert E. Roth. *Cartographic Interaction Primitives: Framework and Synthesis*. The Cartographic Journal, vol. 49, no. 4, pages 376–395, 2012. 49
- [Roy 2009] Chanchal K. Roy, James R. Cordy and Rainer Koschke. *Comparison and evaluation of code clone detection techniques and tools: A qualitative approach*. Journal Science of Computer Programming, vol. 74, no. 7, pages 470 – 495, 2009. Special Issue on Program Comprehension (ICPC 2008). 44
- [Royce 1970] Walker W. Royce. *Managing the development of large software systems: concepts and techniques*. Proceedings of the IEEE WESTCON, Los Angeles, pages 1–9, August 1970. 20, 21

- [Royce 2009] Walker Royce. *Improving Software Economics: Top 10 Principles of Achieving Agility at Scale*, May 2009. 4, 309
- [Ruan 2010] Haowei Ruan, Craig Anslow, Stuart Marshall and James Noble. *Exploring the inventor's paradox: applying jigsaw to software visualization*. In Proceedings of the 5th international symposium on Software visualization, SOFTVIS '10, pages 83–92, New York, NY, USA, 2010. ACM. 303
- [Rubin 2008] Jeffrey Rubin and Dana Chisnell. Handbook of usability testing: How to plan, design, and conduct effective tests. Wiley Publishing, 2 édition, 2008. 270, 271
- [Rufiange 2012] Sébastien Rufiange, Michael J. McGuffin and Christopher P. Fuhrman. *TreeMatrix: A Hybrid Visualization of Compound Graphs*. Computer Graphics Forum, vol. 31, no. 1, pages 89–101, 2012. 304
- [Sack 2006] Warren Sack, Françoise Détienne, Nicolas Ducheneaut, Jean-Marie Burkhardt, Dilan Mahendran and Flore Barcellini. *A Methodological Framework for Socio-Cognitive Analyses of Collaborative Design of Open Source Software*. Journal of Computer Supported Cooperative Work (CSCW), vol. 15, no. 2-3, pages 229–250, 2006. 43
- [Salas 1995] Eduardo Salas, Carolyn Prince, David P. Baker and Lisa Shrestha. *Situation Awareness in Team Performance: Implications for Measurement and Training*. Human Factors: The Journal of the Human Factors and Ergonomics Society, vol. 37, no. 1, pages 123–136, 1995. 159, 160
- [Saldaña-Ramos 2014] Javier Saldaña-Ramos, Javier García Ana Sanz-Esteban and Antonio Amescua. *Skills and abilities for working in a global software development team: a competence model*. Journal of Software: Evolution and Process, vol. 26, no. 3, pages 329–338, 2014. 25, 147
- [Salmon 2013] Paul M. Salmon and Neville A. Stanton. *Situation awareness and safety: Contribution or confusion? Situation awareness and safety editorial*. Safety Science, vol. 56, no. 0, pages 1 – 5, 2013. Situation Awareness and Safety. 148, 157
- [Sangal 2005] Neeraj Sangal, Ev Jordan, Vineet Sinha and Daniel Jackson. *Using Dependency Models to Manage Complex Software Architecture*. In Proceedings of the 20th Annual ACM SIGPLAN Conference on

- Object-oriented Programming, Systems, Languages, and Applications, OOPSLA '05, pages 167–176, New York, NY, USA, 2005. ACM. [XIII](#), [121](#), [122](#), [123](#), [144](#)
- [Santamaría 2009] Rodrigo Santamaría and Roberto Therón. *Treevolution: visual analysis of phylogenetic trees*. *Bioinformatics*, vol. 25, no. 15, pages 1970–1971, August 2009. [14](#), [48](#), [55](#), [58](#)
- [Santamaría 2014] Rodrigo Santamaría, Roberto Therón and Luis Quintales. *BicOverlapper 2.0: visual analysis for gene expression*. *Bioinformatics*, vol. 30, no. 12, pages 1785–1786, 2014. [14](#), [48](#)
- [Sarewitz 2008] Daniel Sarewitz and Richard R. Nelson. *Progress in Know-How: Its Origins and Limits*. *Innovations: Technology, Governance, Globalization*, vol. 3, no. 1, pages 101–117, January 2008. [25](#)
- [Savikhin 2008] Anya Savikhin, Ross Maciejewski and David S. Ebert. *Applied visual analytics for economic decision-making*. In IEEE Symposium on Visual Analytics Science and Technology, 2008. VAST '08., pages 107–114, oct. 2008. [9](#), [10](#), [311](#), [312](#)
- [Sawant 2007] Amit P. Sawant and Naveen Balit. *DiffArchViz: A Tool to Visualize Correspondence Between Multiple Representations of a Software Architecture*. In 4th IEEE International Workshop on Visualizing Software for Understanding and Analysis, 2007. VISSOFT 2007., pages 121–128, 2007. [306](#)
- [Scacchi 2004] Walt Scacchi. *Socio-Technical Interaction Networks in Free/Open Source Software Development Processes*. In *Software Process Modeling*, pages 1–27. Springer Science + Business Media Inc, 2004. [43](#), [44](#), [90](#)
- [Schaeckeler 2009] Stefan Schaeckeler, Weijia Shang and Ruth Davis. *Compiler Optimization Pass Visualization: The Procedural Abstraction Case*. *Transactions in Computing Education*, vol. 9, no. 2, pages 14:1–14:13, June 2009. [305](#)
- [Schatz 2013] Michael C. Schatz, Adam M. Phillippy, Daniel D. Sommer, Arthur L. Delcher, Daniela Puiu, Giuseppe Narzisi, Steven L. Salzberg and Mihai Pop. *Hawkeye and AMOS: visualizing and assessing the quality of genome assemblies*. *Briefings in Bioinformatics*, vol. 14, no. 2, pages 213–224, 2013. [48](#)

- [Schreck 2013] Tobias Schreck and Daniel Keim. *Visual Analysis of Social Media Data*. IEEE Computer, vol. 46, no. 5, pages 68–75, 2013. 49
- [Schumann 2011] Heidrun Schumann and Christian Tominski. *Analytical, visual and interactive concepts for geo-visual analytics*. Journal of Visual Languages and Computing, vol. 22, no. 4, pages 257 – 267, 2011. 49
- [Sensalire 2008] Mariam Sensalire, Patrick Ogao and Alexandru Telea. *Classifying desirable features of software visualization tools for corrective maintenance*. In Proceedings of the 4th ACM symposium on Software visualization, SoftVis '08, pages 87–90, New York, NY, USA, 2008. ACM. 181, 183, 303
- [Sensalire 2009] Mariam Sensalire, Patrick Ogao and Alexandru Telea. *Evaluation of software visualization tools: Lessons learned*. In 5th IEEE International Workshop on Visualizing Software for Understanding and Analysis, 2009. VISSOFT 2009., pages 19–26, 2009. 303
- [Servant 2010] Francisco Servant, James A. Jones and André van der Hoek. *CASI: preventing indirect conflicts through a live visualization*. In Proceedings of the 2010 ICSE Workshop on Cooperative and Human Aspects of Software Engineering, CHASE '10, pages 39–46, New York, NY, USA, 2010. ACM. 38, 306
- [Servant 2012] Francisco Servant and James A. Jones. *History slicing: assisting code-evolution tasks*. In Proceedings of the ACM SIGSOFT 20th International Symposium on the Foundations of Software Engineering, FSE '12, pages 43:1–43:11, New York, NY, USA, 2012. ACM. 306
- [Shah 2008] Hina Shah, Carsten Görg and Mary Jean Harrold. *Visualization of exception handling constructs to support program understanding*. In Proceedings of the 4th ACM symposium on Software visualization, SoftVis '08, pages 19–28, New York, NY, USA, 2008. ACM. 306
- [Sharif 2009a] Bonita Sharif and Jonathan I. Maletic. *The effect of layout on the comprehension of UML class diagrams: A controlled experiment*. In 5th IEEE International Workshop on Visualizing Software for Understanding and Analysis, 2009. VISSOFT 2009., pages 11–18, 2009. 303

- [Sharif 2009b] Khaironi Yatim Sharif and Jim Buckley. *Observation of Open Source programmers' information seeking*. In IEEE 17th International Conference on Program Comprehension, 2009. ICPC '09., pages 307–308, may 2009. 7
- [Sharif 2013] Bonita Sharif, Grace Jetty, Jairo Aponte and Esteban Parra. *An empirical study assessing the effect of seeit 3D on comprehension*. In First IEEE Working Conference on Software Visualization (VISSOFT), 2013, pages 1–10, 2013. 303
- [Sharp 2011] Helen Sharp, Yvonne Rogers and Jenny Preece. *Interaction design: Beyond human-computer interaction*. second edition. John Wiley, UK, 2011. 9, 47, 270, 271, 311
- [Shaverdian 2012] Anna A. Shaverdian, Hao Zhou, George Michailidis, and Hosagrahar V. Jagadish. *A Graph Algebra for Scalable Visual Analytics*. IEEE Computer Graphics and Applications, vol. 32, no. 4, pages 26–33, 2012. 48, 49
- [Sheldon 2002] Frederick T. Sheldon, Kshamta Jerath and Hong Chung. *Metrics for maintainability of class inheritance hierarchies*. Journal of Software Maintenance: Research and Practice, vol. 14, no. 3, pages 147–160, May 2002. 41
- [Shi 2011] Jian Shi, Ying Qiao and Hongan Wang. *Visualizing inference process of a rule engine*. In Proceedings of the 2011 International Symposium Visual Information Communication, VINCI '11, pages 10:1–10:9, New York, NY, USA, 2011. ACM. 305
- [Shneiderman 1996] Ben Shneiderman. *The eyes have it: a task by data type taxonomy for information visualizations*. In Visual Languages, 1996. Proceedings., IEEE Symposium on, pages 336–343, sep 1996. 62, 63, 198
- [Sigovan 2013] Carmen Sigovan, Chris W. Muelder and Kwan-Liu Ma. *Visualizing Large-scale Parallel Communication Traces Using a Particle Animation Technique*. Computer Graphics Forum, vol. 32, no. 3pt2, pages 141–150, 2013. 305
- [Sillito 2006a] Jonathan Sillito. *Asking and Answering Questions During a Programming Change Task*. PhD thesis, The Faculty of Graduate Studies, Computer Science. The University Of British Columbia, December 2006. 39

- [Sillito 2006b] Jonathan Sillito, Gail C. Murphy and Kris De Volder. *Questions programmers ask during software evolution tasks*. In Proceedings of the 14th ACM SIGSOFT international symposium on Foundations of software engineering, SIGSOFT '06/FSE-14, pages 23–34, New York, NY, USA, 2006. ACM. 10, 312
- [Sillito 2006c] Jonathan Sillito, Gail C. Murphy and Kris De Volder. *Questions programmers ask during software evolution tasks*. In Proceedings of the 14th ACM SIGSOFT international symposium on Foundations of software engineering, SIGSOFT '06/FSE-14, pages 23–34, New York, NY, USA, 2006. ACM. 39
- [Sillito 2008] Jonathan Sillito, Gail C. Murphy and Kris De Volder. *Asking and Answering Questions during a Programming Change Task*. IEEE Transactions in Software Engineering, vol. 34, no. 4, pages 434–451, 2008. 39, 40
- [Sips 2012] Mike Sips, Patrick Kothur, Andrea Unger, Hans-Christian Hege and Doris Dransch. *A Visual Analytics Approach to Multiscale Exploration of Environmental Time Series*. IEEE Transactions on Visualization and Computer Graphics, vol. 18, no. 12, pages 2899–2907, 2012. 49
- [Skype Communications SARL 2013] Skype Communications SARL. *Skype*, 2013. www.skype.com. 273
- [Skytree 2013] Skytree. *Big data analytic 2013: industry report*. Rapport technique, Skytree, 2013. 64
- [Sommerville 2011] Ian Sommerville. *Software engineering 9*. Pearson Education, 2011. 21
- [Spence 1982] Robert Spence and Mark Apperley. *Data base navigation: an office environment for the professional*. Behaviour & Information Technology, vol. 1, no. 1, pages 43–54, 1982. 53
- [Spence 2000] Robert Spence. *Information Visualization*. ACM Press, 2000. 51
- [STA 2005] *IEEE Standard for Software Configuration Management Plans*. IEEE Std 828-2005 (Revision of IEEE Std 828-1998), pages 1–19, 2005. XII, 8, 27, 28, 31, 32

- [STA 2006] *International Standard - 14764-2006 - IEEE ISO/IEC 14764:2006, Standard for Software Engineering - Software Life Cycle Processes - Maintenance*. ISO/IEC 14764:2006 (E) IEEE Std 14764-2006 Revision of IEEE Std 1219-1998), pages 1 –46, 2006. 7
- [STA 2010] *Systems and software engineering – Vocabulary*. ISO/IEC/IEEE 24765:2010(E), pages 1 –418, 15 2010. 7, 27
- [Stanton 2001] Neville A. Stanton, P.R.G Chambers and J Piggott. *Situational awareness and safety*. Safety Science, vol. 39, no. 3, pages 189 – 204, 2001. 157
- [Stanton 2006] Neville A. Stanton, Rebecca Stewart, Don Harris, Robert J. Houghton, Chris Baber, Richard McMaster, Paul Salmon, Geoff Hoyle, Guy Walker, Mark S. Young, Mark Linsell, Roy Dymott and Damian Green. *Distributed situation awareness in dynamic systems: theoretical development and application of an ergonomics methodology*. Ergonomics, vol. 49, no. 12-13, pages 1288–1311, 2006. 158
- [Stasko 2000] John Stasko and Eugene Zhang. *Focus+Context Display and Navigation Techniques for Enhancing Radial, Space-Filling Hierarchy Visualizations*. In INFOVIS '00: Proceedings of the IEEE Symposium on Information Visualization 2000, page 57, Washington, DC, USA, 2000. IEEE Computer Society. 52, 58
- [Steinbrückner 2010] Frank Steinbrückner and Claus Lewerentz. *Representing development history in software cities*. In Proceedings of the 5th international symposium on Software visualization, SOFTVIS '10, pages 193–202, New York, NY, USA, 2010. ACM. 306
- [Steinbrückner 2013] Frank Steinbrückner and Claus Lewerentz. *Understanding software evolution with software cities*. Information Visualization, vol. 12, no. 2, pages 200–216, 04 2013. XIV, 131, 132, 133, 143, 306
- [Storey 1998] Margaret-Anne Darragh Storey. *A Cognitive Framework for Describing and Evaluating Software Exploration Tools*. PhD thesis, Burnaby, BC, Canada, Canada, 1998. AAINQ37756. 183, 184
- [Streit 2012] Marc Streit, Hans-Jörg Schulz, Alexander Lex, Dieter Schmalstieg and Heidrun Schumann. *Model-Driven Design for the Visual Analysis of Heterogeneous Data*. IEEE Transactions on Visualization and Computer Graphics, vol. 18, no. 6, pages 998 –1010, june 2012. 49

- [Sukhoo 2005] Aneerav Sukhoo, Andries Barnard, Mariki M. Eloff, John A. Van der Poll and Mahendrenath Motah. *Accommodating Soft Skills in Software Project Management*. In *Issues in Informing Science and Information Technology*, 2005. 25
- [Sullivan 2001] Kevin J. Sullivan, William G. Griswold, Yuanfang Cai and Ben Hallen. *The Structure and Value of Modularity in Software Design*. SIGSOFT Software Engineering Notes, vol. 26, no. 5, pages 99–108, September 2001. 4, 309
- [Sun 2004] Dabo Sun and Ken Wong. *On understanding software tool adoption using perceptual theories*. In *Proceedings ACSE 2004: 4th IEEE International Workshop on Adoption-Centric Software Engineering*, pages 51–55, 2004. 11, 313
- [Sun 2013a] Alexander Sun. *Enabling collaborative decision-making in watershed management using cloud-computing services*. *Environmental Modelling and Software*, vol. 41, no. 0, pages 93 – 97, 2013. 48
- [Sun 2013b] GuoDao Sun, RongHua Liang, FuLi Wu and HuaMin Qu. *A Web-based visual analytics system for real estate data*. *Science China Information Sciences*, vol. 56, no. 5, pages 1–13, 2013. 49
- [Sundararaman 2008] Jaishankar Sundararaman and Godmar Back. *HDPV: interactive, faithful, in-vivo runtime state visualization for C/C++ and Java*. In *Proceedings of the 4th ACM symposium on Software visualization, SoftVis '08*, pages 47–56, New York, NY, USA, 2008. ACM. 303
- [Takatalo 2008] Jari Takatalo, Gote Nyman and Leif Laaksonen. *Components of human experience in virtual environments*. *Computers*, pages 1–15, January 2008. 49
- [Talaie-Khoei 2012] Amir Talaie-Khoei, Pradeep Ray, Nandan Parameshwaran and Lundy Lewis. *A framework for awareness maintenance*. *Journal of Network and Computer Applications*, vol. 35, no. 1, pages 199 – 210, 2012. 23, 38
- [Tao 2012] Yida Tao, Yingnong Dang, Tao Xie, Dongmei Zhang and Sunghun Kim. *How do software engineers understand code changes?: an exploratory study in industry*. In *Proceedings of the ACM SIGSOFT 20th International Symposium on the Foundations of Software Engineering, FSE '12*, pages 51:1–51:11, New York, NY, USA, 2012. ACM. 39, 40

- [TeamViewer GmbH 2013] TeamViewer GmbH. *TeamViewer*, 2013. www.teamviewer.com. 273
- [Telea 2008] Alexandru Telea and Lucian Voinea. *An interactive reverse engineering environment for large-scale C++ code*. In Proceedings of the 4th ACM symposium on Software visualization, SoftVis '08, pages 67–76, New York, NY, USA, 2008. ACM. 306
- [Telea 2009a] Alexandru Telea, Heorhiy Byelas and Lucian Voinea. *A Framework for Reverse Engineering Large C++ Code Bases*. Electronic Notes in Theoretical Computer Science, vol. 233, no. 0, pages 143 – 159, 2009. 306
- [Telea 2009b] Alexandru Telea, Hessel Hoogendorp, Ozan Ersoy and Dennie Reniers. *Extraction and visualization of call dependencies for large C/C++ code bases: A comparative study*. In 5th IEEE International Workshop on Visualizing Software for Understanding and Analysis, 2009. VISSOFT 2009., pages 81–88, 2009. 305
- [Telea 2009c] Alexandru Telea and Lucian Voinea. *Case study: Visual analytics in software product assessments*. In 5th IEEE International Workshop on Visualizing Software for Understanding and Analysis, 2009. VISSOFT 2009., pages 65–72, 2009. 182, 306
- [Telea 2010] Alexandru Telea, Lucian Voinea and Ozan Ersoy. *Visual Analytics in Software Maintenance: Challenges and Opportunities*. In D. Keim and J. Kohlhammer, editors, Proceedings of the 1st European Symposium on Visual Analytics (EuroVAST). Eurographics, 2010. 203, 317
- [Telea 2011] Alexandru Telea and Lucian Voinea. *Visual software analytics for the build optimization of large-scale software systems*. Computational Statistics, vol. 26, no. 4, pages 635–654, March 2011. 49, 196, 203, 303, 310, 317
- [Teyseyre 2009] Alfredo R. Teyseyre and Marcelo R. Campo. *An Overview of 3D Software Visualization*. IEEE Transactions on Visualization and Computer Graphics, vol. 15, no. 1, pages 87–105, 2009. 303
- [Thakur 2011] Sidharth Thakur and Melissa A. Pasquinelli. *Adapting Visual-Analytical Tools for the Exploration of Structural and Dynamical Features of Polymer Conformations*. Macromolecular Theory and Simulations, vol. 20, no. 4, pages 286–298, 2011. 49

- [Thayer 1988] Richard H. Thayer. Software engineering project management, chapitre Software engineering project management: A top-down view, pages 15–53. IEEE Computer Science Press, 1988. 25
- [Therón 2006a] Roberto Therón. *Hierarchical-temporal Data Visualization using a Ring Tree Metaphor*. Lecture Notes in Computer Science. Smart Graphics, 2006. 55, 58
- [Therón 2006b] Roberto Therón. *Hierarchical-Temporal Data Visualization Using a Tree-Ring Metaphor*. In Andreas Butz, Brian Fisher, Antonio Krüger and Patrick Olivier, editeurs, Smart Graphics, volume 4073 of *Lecture Notes in Computer Science*, pages 70–81. Springer, 2006. 9, 52
- [Therón 2006c] Roberto Therón. *Visual Analytics of Paleoceanographic Conditions*. In 2006 IEEE Symposium On Visual Analytics Science And Technology, pages 19 –26, 31 2006-nov. 2 2006. 9, 48, 311
- [Therón 2007] Roberto Therón, Antonio González-Torres, Francisco J. García-Peñalvo and Pablo Santos. *The Use of Information Visualization to Support Software Configuration Management*. Lecture Notes in Computer Science, vol. Volume 4663/2007, pages 317–331, 2007. XVII, XVIII, 247, 250, 253, 255, 343, 347
- [Therón 2008] Roberto Therón, Antonio González-Torres and Francisco J. García-Peñalvo. *Supporting the understanding of the evolution of software items*. In SoftVis '08: Proceedings of the 2008 ACM symposium on Software visualization, New York, NY, USA, 2008. ACM. XVII, XVIII, 253, 255, 347
- [Therón 2010] Roberto Therón and Laura Casares. *Visual Analysis of Time-Motion in Basketball Games*. In Smart Graphics, 10th International Symposium on Smart Graphics, Banff, Canada, June 24-26, 2010, Proceedings, pages 196–207, 2010. 49
- [Therón 2013] Roberto Therón and Laura Fontanillo. *Diachronic-information visualization in historical dictionaries*. Information Visualization, 2013. 56
- [Thomas 2005] James J. Thomas and Kristin A. Cook. Illuminating the path: Research and development agenda for visual analytics. IEEE-Press, 2005. 9, 11, 47, 50, 311, 313
- [Thomas 2006] J.J. Thomas and K.A. Cook. *A Visual Analytics Agenda*. IEEE Computer Graphics and Applications, vol. 26, no. 1, pages 10–13, Jan.-Feb. 2006. 11, 313

- [Tidwell 2011] Jenifer Tidwell. *Designing interfaces*. O'Reilly Media, second edition édition, January 2011. 63
- [Tockey 1999] Steve Tockey. *Recommended skills and knowledge for software engineers*. In Proceedings. 12th Conference on Software Engineering Education and Training, 1999., pages 168–176, Mar 1999. 26
- [Tomaszewski 2011] Brian Tomaszewski, Justine Blanford, Kevin Ross, Scott Pezanowski and Alan M. MacEachren. *Supporting geographically-aware web document foraging and sensemaking*. *Computers, Environment and Urban Systems*, vol. 35, no. 3, pages 192 – 207, 2011. 48, 49
- [Treiber 2009] Martin Treiber, Hong-Linh Truong and Schahram Dustdar. *Service-Oriented Computing — ICSSOC 2008 Workshops*. chapitre On Analyzing Evolutionary Changes of Web Services, pages 284–297. Springer-Verlag, Berlin, Heidelberg, 2009. 44
- [Trümper 2010] Jonas Trümper, Johannes Bohnet and Jürgen Döllner. *Understanding complex multithreaded software systems by using trace visualization*. In Proceedings of the 5th international symposium on Software visualization, SOFTVIS '10, pages 133–142, New York, NY, USA, 2010. ACM. 305
- [Tu 1992] Qiang Tu. On navigation and analysis of software architecture evolution. Master's thesis, University of Waterloo, 1992. 44
- [Tufté 1990] Edward Tufté. *Envisioning information*. Graphics Press, Cheshire, CT, USA, 1990. 51
- [Tufté 1997] Edward R. Tufté. *Visual explanations: images and quantities, evidence and narrative*. Graphics Press, Cheshire, CT, USA, 1997. 51
- [Turley 1995] Richard T. Turley and James M. Bieman. *Competencies of Exceptional and Nonexceptional Software Engineers*. *Journal of Systems and Software*, vol. 28, no. 1, pages 19–38, January 1995. 26
- [Tyakht 2012] Alexander V. Tyakht, Anna S. Popenko, Maxim S. Belenikin, Ilya A. Altukhov, Alexander V. Pavlenko, Elena S. Kostryukova, Oksana V. Selezneva and Andrei K. Larin, Irina Y. Karpova and Dmitry G. Alexeev. *MALINA: a web service for visual analytics of human gut microbiota whole-genome metagenomic reads*. *Source Code for Biology and Medicine*, vol. 7, no. 1, pages 1–5, 2012. 48

- [Valetto 2007] Giuseppe Valetto, Mary Helander, Kate Ehrlich, Sunita Chulani, Mark Wegman and Clay Williams. *Using Software Repositories to Investigate Socio-technical Congruence in Development Projects*. In Proceedings of the Fourth International Workshop on Mining Software Repositories, MSR '07, pages 25–, Washington, DC, USA, 2007. IEEE Computer Society. 90
- [van Harmelen 2007] Frank van Harmelen, Vladimir Lifschitz and Bruce Porter, editeurs. Handbook of knowledge representation (foundations of artificial intelligence). Elsevier Science, 2007. 9, 47, 311
- [van Wijk 2005] Jarke J. van Wijk. *The Value of Visualization*. Visualization Conference, IEEE, vol. 0, page 11, 2005. 198
- [Vanya 2012] Adam Vanya, Rahul Premraj and Hans van Vliet. *Resolving unwanted couplings through interactive exploration of co-evolving software entities-An experience report*. Information and Software Technology, vol. 54, no. 4, pages 347 – 359, 2012. 306
- [Vasa 2009] Rajesh Vasa, Markus Lumpe, Philip Branch and Oscar Nierstrasz. *Comparative analysis of evolving software systems using the Gini coefficient*. In IEEE International Conference on Software Maintenance, 2009. ICSM 2009., pages 179–188, Sept 2009. 43, 44
- [Vassiliadis 2002] Panos Vassiliadis, Alkis Simitsis and Spiros Skiadopoulos. *Conceptual modeling for ETL processes*. In Proceedings of the 5th ACM international workshop on Data Warehousing and OLAP, DOLAP '02, pages 14–21, New York, NY, USA, 2002. ACM. 198
- [Vassiliadis 2009] Panos Vassiliadis and Alkis Simitsis. *Near Real Time ETL*. In Stanislaw Kozielski and Robert Wrembel, editeurs, New Trends in Data Warehousing and Data Analysis, volume 3 of *Annals of Information Systems*, pages 1–31. Springer US, 2009. 198
- [Vicente 2010] Rodrigo Santamaría Vicente. *Visual analysis of gene expression data by means of biclustering*. PhD thesis, University of Salamanca, 2010. 14, 48
- [Viégas 2004] Fernanda B. Viégas, Martin Wattenberg and Kushal Dave. *Studying Cooperation and Conflict Between Authors with History Flow Visualizations*. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems, CHI '04, pages 575–582, New York, NY, USA, 2004. ACM. 56

- [Voinea 2007] Stefan-Lucian Voinea. *Software Evolution Visualization*. PhD thesis, Advanced School for Computing and Imaging, Technische Universiteit Eindhoven, 2007. 196, 310
- [von Pilgrim 2008] Jens von Pilgrim and Kristian Duske. *Gef3D: a framework for two-, two-and-a-half-, and three-dimensional graphical editors*. In Proceedings of the 4th ACM symposium on Software visualization, SoftVis '08, pages 95–104, New York, NY, USA, 2008. ACM. 303
- [Vrhoveca 2013] Simon L. R. Vrhoveca, Marina Trkmana, Ales Kumera, Marjan Krispera and Damjan Vavpotica. *Outsourcing as an Economic Development Tool in Transition Economies: Scattered Global Software Development*. Information Technology for Development, vol. 0, no. 0, pages 1–15, 2013. 24
- [Walny 2011] Jagoda Walny, Jonathan Haber, Marian Dörk, Jonathan Sillito and Sheelagh Carpendale. *Follow that sketch: Lifecycles of diagrams and sketches in software development*. In 6th IEEE International Workshop on Visualizing Software for Understanding and Analysis (VISSOFT), 2011, pages 1–8, 2011. 303
- [Wang 2010] Xiaoyu Wang, Wenwen Dou, Shen-En Chen, William Ribarsky and Remco Chang. *An Interactive Visual Analytics System for Bridge Management*. Computer Graphics Forum, vol. 29, no. 3, pages 1033–1042, 2010. 48
- [Wang 2011] Taowei Wang, Krist Wongsuphasawat, Catherine Plaisant and Ben Shneiderman. *Extracting Insights from Electronic Health Records: Case Studies, a Visual Analytics Process Model, and Design Recommendations*. Journal of Medical Systems, vol. 35, pages 1135–1152, 2011. 10.1007/s10916-011-9718-x. 49
- [Wang 2012] Xiaoyu Wang, Dong Jeong, Remco Chang and William Ribarsky. *RiskVA: A visual analytics system for consumer credit risk analysis*. Tsinghua Science and Technology, vol. 17, no. 4, pages 440–451, 2012. 49
- [Ware 2004] Colin Ware. Information Visualization, Second Edition: Perception for Design (Interactive Technologies). Morgan Kaufmann, 2 édition, April 2004. 160
- [Weaver 2006] Chris Weaver, David Fyfe, Anthony Robinson, Deryck Holdsworth and Donna Peuquet. *Visual Analysis of Historic Hotel*

- Visitation Patterns*. In 2006 IEEE Symposium On Visual Analytics Science And Technology, pages 35–42, 31 2006-nov. 2 2006. 9, 311
- [Weber 2001] Marc Weber, Marc Alexa and Wolfgang Muller. *Visualizing time-series on spirals*. Information Visualization, 2001. INFOVIS 2001. IEEE Symposium on, pages 7–13, 2001. 55
- [Wehrend 1990] Stephen Wehrend and Clayton Lewis. *A problem-oriented classification of visualization techniques*. In Visualization '90. Proceedings of the First IEEE Conference on Visualization, pages 139–143, 469, oct 1990. 61
- [Wei 2012] Jishang Wei, Hongfeng Yu, Ray W. Grout, Jacqueline H. Chen and Kwan-Liu Ma. *Visual Analysis of Particle Behaviors to Understand Combustion Simulations*. IEEE Computer Graphics and Applications, vol. 32, no. 1, pages 22–33, jan.-feb. 2012. 49
- [Weiser 1981] Mark Weiser. *Program slicing*. In ICSE '81: Proceedings of the 5th international conference on Software engineering, pages 439–449, Piscataway, NJ, USA, 1981. IEEE Press. 43, 90
- [Wettel 2007] Richard Wettel and Michele Lanza. *Visualizing Software Systems as Cities*. In 4th IEEE International Workshop on Visualizing Software for Understanding and Analysis, 2007. VISSOFT 2007., pages 92–99, 2007. XIII, 115, 143, 306
- [Wettel 2008a] Richard Wettel and Michele Lanza. *Visual Exploration of Large-Scale System Evolution*. In 15th Working Conference on Reverse Engineering, 2008. WCRE '08., pages 219–228, Oct 2008. XIII, 115, 130, 131, 143
- [Wettel 2008b] Richard Wettel and Michele Lanza. *Visually localizing design problems with disharmony maps*. In Proceedings of the 4th ACM symposium on Software visualization, SoftVis '08, pages 155–164, New York, NY, USA, 2008. ACM. 305
- [Wettel 2011] Richard Wettel, Michele Lanza and Romain Robbes. *Software systems as cities: a controlled experiment*. In Proceedings of the 33rd International Conference on Software Engineering, ICSE '11, pages 551–560, New York, NY, USA, 2011. ACM. 306
- [Wetzel 2004] Kai Wetzel. *Pebbles: Using Circular Treemaps to visualize disk usage*. SourceForge.net, Setiembre 2004. 56

- [Wieringa 2006] Roel Wieringa, Neil Maiden, Nancy Mead and Colette Rolland. *Requirements engineering paper classification and evaluation criteria: a proposal and a discussion*. Requirements Engineering, vol. 11, no. 1, pages 102–107, 2006. 71
- [Wilkinson 2005] Leland Wilkinson. The grammar of graphics (statistics and computing). Springer-Verlag New York, Inc., Secaucus, NJ, USA, 2005. 63
- [Willems 2010] Niels Willems, Willem Robert van Hageb, Gerben de Vriesc, Jeroen H.M. Janssens and Véronique Malaisé. *An integrated approach for visual analysis of a multisource moving objects knowledge base*. International Journal of Geographical Information Science, vol. 24, no. 10, pages 1543–1558, October 2010. 49
- [Witten 2005] Ian H. Witten and Eibe Frank. Data mining: Practical machine learning tools and techniques, second edition (morgan kaufmann series in data management systems). Morgan Kaufmann Publishers Inc., San Francisco, CA, USA, 2005. 9, 47, 311
- [Wu 2010] Yongzheng Wu, Roland H.C. Yap and Felix Halim. *Visualizing windows system traces*. In Proceedings of the 5th international symposium on Software visualization, SOFTVIS '10, pages 123–132, New York, NY, USA, 2010. ACM. 305
- [Xie 2008] Shaohua Xie, Eileen Kraemer, R. E. K. Stirewalt, Laura K. Dillon and Scott D. Fleming. *Assessing the benefits of synchronization-adorned sequence diagrams: two controlled experiments*. In Proceedings of the 4th ACM symposium on Software visualization, SoftVis '08, pages 9–18, New York, NY, USA, 2008. ACM. 303
- [Xie 2009] Shaohua Xie, Eileen Kraemer, R. E. K. Stirewalt, Laura K. Dillon and Scott D. Fleming. *Design and evaluation of extensions to UML sequence diagrams for modeling multithreaded interactions*. Information Visualization, vol. 8, no. 2, pages 120–136, Summer 2009. 303
- [Xu 2009] Shaochun Xu, Xuhui Chen and Dapeng Liu. *Classifying software visualization tools using the Bloom's taxonomy of cognitive domain*. In Canadian Conference on Electrical and Computer Engineering, 2009. CCECE '09., pages 13–18, 2009. 39, 303

- [Yang 2003] Jing Yang, Matthew O. Ward, Elke A. Rundensteiner and Anilkumar Patro. *InterRing: a visual interface for navigating and manipulating hierarchies*. Information Visualization, vol. 2, no. 1, pages 16–30, 2003. 52, 58
- [Yang 2005] Hong Yul Yang, Ewan Tempero and Rebecca Berrigan. *Detecting indirect coupling*. In Proceedings of the Australian Software Engineering Conference, ASWEC 2005., pages 212–221, 2005. 44
- [Yang 2007] Hong Yul Yang and E. Tempero. *Measuring the Strength of Indirect Coupling*. In Proceedings of the Australian Software Engineering Conference, 2007. ASWEC 2007., pages 319–328, 2007. 44, 89
- [Yang 2013] Jing Yang, Yujie Liu, Xin Zhang, Xiaoru Yuan, Ye Zhao, Scott Barlowe and Shixia Liu. *PIWI: Visually Exploring Graphs Based on Their Community Structure*. IEEE Transactions on Visualization and Computer Graphics, vol. 19, no. 6, pages 1034–1047, 2013. 48
- [Young 1998] Peter Young and Malcolm Munro. *Visualising software in virtual reality*. In Proceedings., 6th International Workshop on Program Comprehension, 1998. IWPC '98., pages 19–26, Jun 1998. 161, 162
- [Yu 2004] Liguu Yu, Stephen R. Schach, Kai Chen and Jeff Offutt. *Categorization of Common Coupling and Its Application to the Maintainability of the Linux Kernel*. IEEE Transactions in Software Engineering, vol. 30, no. 10, pages 694–706, October 2004. 44
- [Yuan 2010] Xiaoru Yuan, He Xiao, Hanqi Guo, Peihong Guo, W. Kendall, Jian Huang and Yongxian Zhang. *Scalable Multi-variate Analytics of Seismic and Satellite-based Observational Data*. IEEE Transactions on Visualization and Computer Graphics, vol. 16, no. 6, pages 1413–1420, nov.-dec. 2010. 48
- [Zeckzer 2008] Dirk Zeckzer, Robert Kalcklösch, Lutz Schröder, Hans Hagen and T. Klein. *Analyzing the reliability of communication between software entities using a 3D visualization of clustered graphs*. In Proceedings of the 4th ACM symposium on Software visualization, SoftVis '08, pages 37–46, New York, NY, USA, 2008. ACM. 305
- [Zhang 2009] Dehua Zhang, E. Duala-Ekoko and L. Hendren. *Impact analysis and visualization toolkit for static crosscutting in AspectJ*. In IEEE

- 17th International Conference on Program Comprehension, 2009. ICPC '09., pages 60–69, 2009. 306
- [Zhang 2012] Leishi Zhang, Andreas Stoffel, Michael Behrisch, Sebastian Mittelstadt, Tobias Schreck, Rene Pompl, Stefan Weber, Holger Last and Daniel Keim. *Visual analytics for the big data era: A comparative review of state-of-the-art commercial systems*. In IEEE Conference on Visual Analytics Science and Technology (VAST), 2012, pages 173–182, 2012. 64
- [Zhao 2002] Jianjun Zhao, Hongji Yang, Liming Xiang and Baowen Xu. *Change Impact Analysis to Support Architectural Evolution*. Journal of Software Maintenance and Evolution: Research and Practice, vol. 14, no. 5, pages 317–333, September 2002. 44
- [Zhao 2005] Shengdong Zhao, Michael J. McGuffin and Mark H. Chignell. *Elastic hierarchies: combining treemaps and node-link diagrams*. In IEEE Symposium on Information Visualization, 2005. INFOVIS 2005., pages 57–64, Oct 2005. XIII, 119, 120
- [Ziegler 2010] H. Ziegler, M. Jenny, T. Gruse and D.A. Keim. *Visual market sector analysis for financial time series data*. In 2010 IEEE Symposium on Visual Analytics Science and Technology (VAST), pages 83–90, oct. 2010. 9, 311
- [Zimmer 2010] Stephan Zimmer and Stephan Diehl. *Visual Amortization Analysis of Recompilation Strategies*. In 14th International Conference Information Visualisation (IV), 2010, pages 509–514, 2010. 305
- [Zou 2003] Lijie Zou and Michael W. Godfrey. *Detecting merging and splitting using origin analysis*. In Proceedings Working Conference Reverse Engineering (WCRE), pages 146–154. IEEE Computer Society Press, 2003. 43, 44