

Pedro Szekely

Research Director of the Center on Knowledge Graphs,
Principal Scientist in the Information Sciences Institute,
Research Associate Professor in the Department of Computer Science,
University of Southern California
4676 Admiralty Way, Marina del Rey, CA 90292

pszekely@isi.edu
<http://www.isi.edu/~szekely>
(562)889-3149

Much of my research is in the Semantic Web, where I have made significant scientific and engineering contributions, both in ontologies and Linked Data. My group has been a leader in integrating machine learning technologies into ontological frameworks. For example, my group developed the Karma open source Semantic Web software released by ISI, which includes several learning-based components for automatically discovering labels and alignments across structured datasets and ontologies.

A key differentiator of my work is a passion for building practical solutions that operate on real data and are deployed in real-world operational environments. Most recently, I led a large multi site effort under the DARPA Memex program. The effort, Domain-Specific Insight Graphs (DIG), developed technology for building knowledge graphs from structured, semi-structured and unstructured sources. DIG is a full pipeline system including crawling, information extraction and harmonization, entity resolution, query and visualization. The most important application built using DIG ingests over 100 million escort advertisements to build a knowledge graph to help law enforcement combat human trafficking. This DIG application has been used to investigate cases and compile evidence that led to the rescue of minors trapped in human trafficking and the conviction of traffickers in multiple cases.

At ISI I am the director of the Center on Knowledge Graphs, a research group of over 40 people including researchers, developers and students. I am active in the professional community, having served as conference and program chair on three academic conferences. Papers I co-authored received best paper awards in the leading Semantic Web conferences for research on entity resolution (2016) and for the application of Semantic Web technologies in real applications (2013 and 2015).

Personal

- Birthdate: May 16, 1957
- Birthplace: Bogota, Colombia
- Citizenship: United States

Education

- **Ph.D.** in Computer Science, Carnegie-Mellon University, Pittsburgh, 1987
Dissertation: *Separating the User Interface from the Functionality of Application Programs*

Advisor: *Philip J. Hayes*

- **M.S.** in Computer Science, Carnegie-Mellon University, Pittsburgh, 1982
- **B.S.** in Mathematics, Universidad de los Andes, Bogota, Colombia, 1980
- **B.S.** in Computer Science, Universidad de los Andes, Bogota, Colombia, 1979

Professional

- **Conference Chair:** International Conference on Knowledge Capture (KCAP 2019)
- **Workshop Co-Organizer:** Hybrid Statistical Semantic Understanding and Emerging Semantics (ISWC 2017)
- **Program Chair:** Intelligent User Interfaces Conference (IUI 2013)
- **Conference Chair:** Intelligent User Interfaces Conference (IUI 2000)
- **Conference Chair:** User Interface Software and Technology (UIST 1994)
- **Workshop Organizer:** Help Me Help You: Bridging the Gaps in Human-Agent Collaboration (AAAI Spring Symposium 2011)
- **Workshop Organizer:** Transforming the UI for Anyone (CHI 2001)
- **Plenary Speaker:** Retrospective and Challenges for Model-Based Interface Development (CADUI 1995)
- **Program Committee and/or Paper Reviewer:** AAAI, AAMAS, CADUI, CHI, ESWC, HCI, IJCAI, ISWC, IUI, UIST, WWW (multiple years)
- **Review Panel:** (NSF 1998)

Awards

- **USC Viterbi School of Engineering, Use-Inspired Research Award:** Knowledge graphs and domain-specific search to support human-trafficking investigations (2018)
- **Best Paper:** Linhong Zhu, Majid Ghasemi-Gol, Pedro Szekely, Aram Galstyan and Craig A. Knoblock. Unsupervised Entity Resolution on Multi-type Graphs. In ISWC 2016 - 15th International Semantic Web Conference, 2016.
- **Best In-Use Paper:** Pedro Szekely, Craig A Knoblock, Jason Slepicka, Andrew Philpot, Amandeep Singh, Chengye Yin, Dipsy Kapoor, Prem Natarajan, Daniel Marcu, Kevin Knight, et al. Building and using a knowledge graph to combat human trafficking. In The Semantic Web-ISWC 2015, pages 205221. Springer International Publishing, 2015.
- **Best In-Use Paper:** Pedro Szekely, Craig A Knoblock, Yang Fengyu, Xuming Zhu, Eleanor Fink, Rachel Allen, and Georgina Goodlander. Connecting the Smithsonian American Art Museum to the Linked Data Cloud (ESWC 2013).

- **Best Demonstration:** Rajiv T Maheswaran, Craig M Rogers, Romeo Sanchez, and Pedro Szekely. Decision-Support for Real-Time Multi-Agent Coordination (AAMAS 2010).
- **ISI Meritorious Service Award:** Winners of DARPA COORDINATORS program evaluation (2007)
- **ISI Meritorious Service Award:** Winners of DARPA COORDINATORS program evaluation (2006)
- **ISI Meritorious Service Award:** Delivering working system to Defense Logistics Agency, DEALMAKER project (1999)

Teaching

- **Building Knowledge Graphs** (INF 558) University of Southern California. Fall 2017 (*student evaluation 4.61/5.0*), Fall 2018 (*student evaluation 3.52/5.0*)
- **Information Integration on the Web** (CS 548), University of Southern California. Spring 2012 (*student evaluation 3.89/5.0*), Spring 2013 (*student evaluation 4.37/5.0*), Fall 2013 (*student evaluation 4.31/5.0*), Spring 2014, Fall 2014 (*student evaluation 4.22/5.0*) and Fall 2015 two sections (*student evaluation 4.53 and 4.74/5.0*)
- **Introduction to Semantic Web**, Universidad Javeriana, Colombia. Summer 2013.
- **Introduction to Semantic Web**, Universidad de Los Andes, Colombia. Summer 2012.
- **Human Computer Interaction** (CS 588), University of Southern California. 1996.
- **Model-Based User Interface Development** (Tutorial), CHI Conference. 1994.
- **Linear Algebra, Calculus, Set Theory**, Universidad de Los Andes, Colombia. 1979-1980.

Ph.D. Students

Ph.D. Advisor/Co-Advisor

- 1992: Ping Luo (USC), PhD primary advisor, graduated.
- 1994: Ewald Salcher (University of Graz, Austria), PhD co-advisor, graduated.
- 2004: Juan Francisco Lopez (USC), PhD primary advisor, graduated.
- 2008: Rattapoom Tuchinda (USC), Ph.D. co-advisor, graduated.
- 2009: Jing Jin (USC), Ph.D. primary advisor, graduated. Winner of the Most Creative Ph.D. Dissertation award in the USC Viterbi School of Engineering.
- 2015: Majid Ghasemi Gol (USC CS), Ph.D. primary advisor, current.
- 2018: Ehsan Qasemi (USC CS), Ph.D. primary advisor, current.

Ph.D. Dissertation Committee Member

- 1996: Ali Erdem (USC), Dissertation committee, graduated.
- 1996: Ken Anderson (UCI), Dissertation committee, graduated.
- 2003: In-Young Ko (USC), Dissertation committee, graduated.
- 2006: Ranbo Yu (USC): Dissertation committee, graduated.
- 2009: Sang Yun Lee (USC), Dissertation committee, graduated.
- 2009: Harris Chiu (USC), Dissertation committee, in progress.

Contracts

Principal Investigator and Co-Principal Investigator

- SAGE: Synergistic Anticipation of Geopolitical Events. Agency: IARPA. Period of Support: 1 April 2017 to 31 March 2021 (**Co-PI**).
- ELICIT: Elicitation of Causal Factors and Links to Assist Military Planners. Agency: DARPA. Period of Support: 1 August 2017 to 30 September 2021 (**Co-PI**).
- DSBOX: Data Scientist in a Box. Agency: DARPA. Period of Support: 1 April 2017 to 31 March 2021 (**PI**). *\$6,700,000*.
- Text-enabled Humanitarian Operations Run-time Framework. Agency: DARPA. Period of Support: 1 May 2015 to 30 April 2019 (**PI**). *\$2,209,000*.
- Domain-Specific Insight Graphs. Agency: DARPA. Period of Support: 1 October 2014 to 30 September 2018 (**PI**). *\$8,000,000*.
- NS CTA Option Yrs 6 and 7 (Co-PI). Agency: ARL. Period of Support: Sep-28-2014 to Sep-27-2016 (**Co-PI**). *\$451,760*.
- SocialViz, DARPA/STTR, 2012 - present (**PI**). *Phase 1: \$58,200, Phase 2 awarded: \$750,000*.
- GAMBIT: Geospatial Analysis of Motion-Based Intelligence and Tracking, ONR 2012 - 2013 (**Co-PI**). *\$2,520,000*.
- COMPASS: Criticality, Options and Metrics for Plan Analysis by Stochastic Simulation, DARPA. 2010 - 2011 (**Co-PI**). *\$1,200,000*.
- LANdroids: Distributed Control Algorithms, DARPA. 2008 (**Co-PI**) *\$549,999*.
- MARBLES: negotiation technology, AFOSR. 2002 - 2005 (**Co-PI**) *\$496,707*.
- WEBSRIPTER: semantic web, DARPA. 2000 - 2004 (**Co-PI**) *\$1,359,824*.
- Product News Network: user interfaces, Thomas Register. 1997 - 1998 (**PI**)
- MASTERMIND: user interfaces, DARPA, 1995 - 2000 (**PI**)

Research Team Leader

- Smithsonian American Art, Smithsonian Institution, 2012 - 2013. \$200,000.
- CSC: multi-agent coordination, DARPA. 2005 - 2010. \$11,177,741.
- CAMERA: negotiation technology. DARPA. 1998 - 2004.
- DEALMAKER: user interfaces, expert systems, DARPA and DLA (Defense Logistics Agency). 1996 - 1999.

Key Personnel

- Effectively Forecasting Evolving Cyber Threats, IARPA, 2016-2020 \$15,257,720
- DOVETAIL: Domain Vocabulary Extraction and Transduction + Auto-Induction of Layout, IARPA, 2010 - 2013. \$1,577,164.
- Heracles: Information integration and human computer interaction, SOCOM. 2005 - 2007.
- CARTE: negotiation technology, ONR. 2003 - 2005. \$4,490,887.
- SHELTER: user interfaces, knowledge acquisition, DARPA, 1992 - 1995.
- DRAMA: user interfaces, expert systems, DARPA, 1989 - 1992.
- BEAMER: user interfaces, DARPA, research scientist, 1988- 1989.

Publications

- [1] Y. Liu, L. Zhu, P. Szekely, A. Galstyan, and D. Koutra. Coupled clustering of time-series and networks. In *SIAM International Conference on Data Mining, (SDM19)*, 2019.
- [2] P. Szekely and M. Kejriwal. Domain-specific insight graphs (dig). In *Companion of the The Web Conference 2018 on The Web Conference 2018*, pages 433–434. International World Wide Web Conferences Steering Committee, 2018.
- [3] M. Kejriwal, P. Szekely, and C. Knoblock. Investigative knowledge discovery for combating illicit activities. *IEEE Intelligent Systems*, (1):53–63, 2018.
- [4] M. Kejriwal and P. Szekely. Technology-assisted investigative search: A case study from an illicit domain. In *Extended Abstracts of the 2018 CHI Conference on Human Factors in Computing Systems*, page CS17. ACM, 2018.
- [5] M. Kejriwal and P. Szekely. Constructing domain-specific search engines with no programming. In *Thirty-Second AAAI Conference on Artificial Intelligence*, 2018.
- [6] M. Kejriwal, J. Peng, H. Zhang, and P. Szekely. Structured event entity resolution in humanitarian domains. In *International Semantic Web Conference*, pages 233–249. Springer, Cham, 2018.

- [7] M. Kejriwal, D. Gilley, P. Szekely, and J. Crisman. Thor: Text-enabled analytics for humanitarian operations. In *Companion of the The Web Conference 2018 on The Web Conference 2018*, pages 147–150. International World Wide Web Conferences Steering Committee, 2018.
- [8] Y. Gil, K.-T. Yao, V. Ratnakar, D. Garijo, G. Ver Steeg, P. Szekely, R. Brekelmans, M. Kejriwal, F. Luo, and I.-H. Huang. P4ml: A phased performance-based pipeline planner for automated machine learning. In *AutoML Workshop at ICML*, 2018.
- [9] M. Ghasemi-Gol and P. Szekely. Tabvec: Table vectors for classification of web tables. *arXiv preprint arXiv:1802.06290*, 2018.
- [10] C. A. Knoblock, P. Szekely, E. Fink, D. N. Duane Degler, R. Sanderson, K. Blanch, S. Snyder, N. Chheda, N. Jain, R. R. Krishna, N. B. Sreekanth, and Y. Yao. Lessons learned in building linked data for the american art collaborative. In *ISWC 2017 - 16th International Semantic Web Conference*, 2017.
- [11] M. Kejriwal and P. Szekely. Supervised typing of big graphs using semantic embeddings. In *Proceedings of The International Workshop on Semantic Big Data, SIGMOD 2017, Chicago, IL, USA, May 19, 2017*, pages 3:1–3:6, 2017.
- [12] M. Kejriwal and P. Szekely. Scalable generation of type embeddings using the abox. *OJSW*, 4(1):20–34, 2017.
- [13] M. Kejriwal and P. Szekely. Neural embeddings for populated geonames locations. In *The Semantic Web - ISWC 2017 - 16th International Semantic Web Conference, Vienna, Austria, October 21-25, 2017, Proceedings, Part II*, pages 139–146, 2017.
- [14] M. Kejriwal and P. Szekely. Knowledge graphs for social good: An entity-centric search engine for the human trafficking domain. *IEEE Transactions on Big Data*, 2017.
- [15] M. Kejriwal and P. Szekely. An investigative search engine for the human trafficking domain. In *The Semantic Web - ISWC 2017 - 16th International Semantic Web Conference, Vienna, Austria, October 21-25, 2017, Proceedings, Part II*, pages 247–262, 2017.
- [16] M. Kejriwal and P. Szekely. Information extraction in illicit web domains. In *Proceedings of the 26th International Conference on World Wide Web, WWW 2017, Perth, Australia, April 3-7, 2017*, pages 997–1006, 2017.
- [17] M. Kejriwal, T. Schellenberg, and P. Szekely. A semantic search engine for investigating human trafficking. In *Proceedings of the ISWC 2017 Posters & Demonstrations and Industry Tracks co-located with 16th International Semantic Web Conference (ISWC 2017), Vienna, Austria, October 23rd - to - 25th, 2017.*, 2017.
- [18] M. Kejriwal, J. Ding, R. Shao, A. Kumar, and P. Szekely. Flagit: A system for minimally supervised human trafficking indicator mining. In *Workshop on Learning with Limited Labeled Data co-held with NIPS 2017*, 2017.
- [19] R. Kapoor, M. Kejriwal, and P. Szekely. Using contexts and constraints for improved geotagging of human trafficking webpages. In *Proceedings of the Fourth International ACM Workshop on Managing and Mining Enriched Geo-Spatial Data, Chicago, IL, USA, May 14, 2017*, pages 3:1–3:6, 2017.

- [20] E. Heiden, G. Hoberg, C. A. Knoblock, P. Modi, G. Phillips, G. Raul, and P. Szekely. Web text-based network industry classifications: Preliminary results. In *Proceedings of DSMM: Data Science for Macro-Modeling with Financial and Economic Datasets*, 2017.
- [21] L. Zhu, M. Ghasemi-Gol, P. Szekely, A. Galstyan, and C. A. Knoblock. Unsupervised Entity Resolution on Multi-type Graphs. pages 649–667. Springer, Cham, 2016.
- [22] L. Zhu, M. Ghasemi-Gol, P. Szekely, A. Galstyan, and C. A. Knoblock. Unsupervised entity resolution on multi-type graphs. In *ISWC 2016 - 15th International Semantic Web Conference*, 2016.
- [23] M. Taheriyani, C. A. Knoblock, P. Szekely, and J. L. Ambite. Leveraging Linked Data to Discover Semantic Relations Within Data Sources. pages 549–565. Springer, Cham, 2016.
- [24] M. Taheriyani, C. A. Knoblock, P. Szekely, and J. L. Ambite. Learning the semantics of structured data sources. *Web Semantics: Science, Services and Agents on the World Wide Web*, 2016.
- [25] M. Taheriyani, C. Knoblock, P. Szekely, and J. L. Ambite. Leveraging linked data to discover semantic relations within data sources. In *ISWC 2016 - 15th International Semantic Web Conference*, 2016.
- [26] J. Schaible, P. Szekely, and A. Scherp. Comparing Vocabulary Term Recommendations Using Association Rules and Learning to Rank: A User Study. In *International Semantic Web Conference*, pages 214–230. Springer International Publishing, 2016.
- [27] M. Pham, S. Alse, C. A. Knoblock, and P. Szekely. Semantic Labeling: A Domain-Independent Approach. pages 446–462. Springer, Cham, 2016.
- [28] M. Pham, S. Alse, C. Knoblock, and P. Szekely. Semantic labeling: A domain-independent approach. In *ISWC 2016 - 15th International Semantic Web Conference*, 2016.
- [29] C. Paul, A. Rettinger, A. Mogadala, C. A. Knoblock, and P. Szekely. Efficient graph-based document similarity. In *The Semantic Web. Latest Advances and New Domains. 13th Extended Semantic Web Conference (ESWC), Crete, Greece.*, 2016. **Best Research Paper Nominee**.
- [30] G. Gawriljuk, A. Harth, C. A. Knoblock, and P. Szekely. A scalable approach to incrementally building knowledge graphs. In *TPDL 2016 - 20th International Conference on Theory and Practice of Digital Libraries*, 2016.
- [31] M. Taheriyani, C. A. Knoblock, P. Szekely, J. L. Ambite, and Y. Chen. Leveraging linked data to infer semantic relations within structured sources. *Proceedings of the 6th International Workshop on Consuming Linked Data (COLD 2015)*, 2015.
- [32] P. Szekely, C. A. Knoblock, J. Slepicka, A. Philpot, A. Singh, C. Yin, D. Kapoor, P. Natarajan, D. Marcu, K. Knight, et al. Building and using a knowledge graph to combat human trafficking. In *The Semantic Web-ISWC 2015*, pages 205–221. Springer International Publishing, 2015.
- [33] J. Slepicka, C. Yin, P. Szekely, and C. A. Knoblock. Kr2rml: An alternative interpretation of r2rml for heterogenous sources. In *Proceedings of the 6th International Workshop on Consuming Linked Data (COLD 2015)*, 2015.

- [34] S. K. Ramnandan, A. Mittal, C. A. Knoblock, and P. Szekely. Assigning semantic labels to data sources. In *Proceedings of the 12th ESWC*, pages 403–417. Springer International Publishing, 2015.
- [35] O. P. Patri, K. Singh, P. Szekely, A. V. Panangadan, and V. K. Prasanna. Personalized trip planning by integrating multimodal user-generated content. In *Semantic Computing (ICSC), 2015 IEEE International Conference on*, pages 381–388. IEEE, 2015.
- [36] C. A. Knoblock and P. Szekely. A scalable architecture for extracting, aligning, linking, and visualizing multi-int data. In *SPIE Sensing Technology+ Applications*, pages 949907–949907. International Society for Optics and Photonics, 2015.
- [37] C. A. Knoblock and P. Szekely. Exploiting semantics for big data integration. *AI Magazine*, 36(1):25–38, 2015.
- [38] S. Hu, S. Yao, H. Jin, Y. Zhao, Y. Hu, X. Liu, N. Naghibolhosseini, S. Li, A. Kapoor, W. Dron, L. Su, A. BarNoy, P. Szekely, R. Govindan, R. Hobbs, and T. Abdelzaher. Data acquisition for real-time decision-making under freshness constraints. In *2015 IEEE Real-Time Systems Symposium (RTSS)*, 2015.
- [39] B. Wu, P. Szekely, and C. A. Knoblock. Minimizing user effort in transforming data by example. In *Proceedings of the 19th international conference on Intelligent User Interfaces*, pages 317–322. ACM, 2014.
- [40] M. Taheriyan, C. A. Knoblock, P. Szekely, and J. L. Ambite. A scalable approach to learn semantic models of structured sources. In *Semantic Computing (ICSC), 2014 IEEE International Conference on*, pages 183–190. IEEE, 2014.
- [41] P. Szekely, C. A. Knoblock, F. Yang, E. E. Fink, S. Gupta, R. Allen, and G. Goodlander. Publishing the data of the smithsonian american art museum to the linked data cloud. *International Journal of Humanities and Arts Computing*, 8(supplement):152–166, 2014.
- [42] R. Nourjou, P. Szekely, M. Hatayama, M. Ghafory-Ashtiany, and S. F. Smith. Data model of the strategic action planning and scheduling problem in a disaster response team. *Journal of Disaster Research*, 9(3):381–399, 2014.
- [43] R. Nourjou, S. F. Smith, M. Hatayama, and P. Szekely. Intelligent algorithm for assignment of agents to human strategy in centralized multi-agent coordination. *Journal of Software*, 9(10):2586–2597, 2014.
- [44] R. Nourjou, S. F. Smith, M. Hatayama, N. Okada, and P. Szekely. Dynamic assignment of geospatial-temporal macro tasks to agents under human strategic decisions for centralized scheduling in multi-agent systems. *International Journal of Machine Learning and Computing (IJMLC)*, 4(1):39–46, 2014.
- [45] S. Narayanan, A. Jaiswal, Y.-Y. Chiang, Y. Geng, C. A. Knoblock, and P. Szekely. Integration and automation of data preparation and data mining. In *Data Mining Workshop (ICDMW), 2014 IEEE International Conference on*, pages 1076–1085. IEEE, 2014.

- [46] M. Maleshkova, R. Verborgh, S. Stadtmüller, and P. Szekely. Proceedings of the second workshop on services and applications over linked apis and data. 2014.
- [47] E. E. Fink, P. Szekely, and C. A. Knoblock. How linked open data can help in locating stolen or looted cultural property. In *Digital Heritage. Progress in Cultural Heritage: Documentation, Preservation, and Protection*, pages 228–237. Springer International Publishing, 2014.
- [48] A. Dimou, M. V. Sande, J. Slepicka, P. Szekely, E. Mannens, C. Knoblock, and R. V. d. Walle. Mapping hierarchical sources into rdf using the rml mapping language. In *Semantic Computing (ICSC), 2014 IEEE International Conference on*, pages 151–158. IEEE, 2014.
- [49] Y. Zhang, Y.-Y. Chang, P. Szekely, and C. A. Knoblock. A semantic approach to retrieving, linking, and integrating heterogeneous geospatial data. In *Proceedings of the 2013 IJCAI Workshop on Semantic Cities*, 2013.
- [50] M. Taheriyani, C. A. Knoblock, P. Szekely, and J. L. Ambite. A graph-based approach to learn semantic descriptions of data sources. In *Proceedings of the 12th International Semantic Web Conference (ISWC 2013)*, 2013.
- [51] P. Szekely, C. A. Knoblock, Y. Fengyu, X. Zhu, E. Fink, R. Allen, and G. Goodlander. Connecting the Smithsonian American Art Museum to the Linked Data Cloud (best in-use paper). In *Proceedings of the 10th Extended Semantic Web Conference (ESWC 2013)*, Montpellier, May 2013.
- [52] C. A. Knoblock, P. A. Szekely, S. Gupta, A. Manglik, R. Verborgh, F. Yang, and R. Van de Walle. Publishing data from the smithsonian american art museum as linked open data. In *International Semantic Web Conference (Posters & Demos)*, pages 129–132, 2013.
- [53] C. A. Knoblock and P. Szekely. Semantics for big data integration and analysis. *2013 AAAI Fall Symposium Series*, 2013.
- [54] A. Harth, C. Knoblock, S. Stadtmüller, R. Studer, and P. Szekely. On-the-fly integration of static and dynamic sources. In *Proceedings of the Fourth International Workshop on Consuming Linked Data (COLLD2013)*, 2013.
- [55] B. Wu, P. Szekely, and C. A. Knoblock. Learning Data Transformation Rules through Examples: Preliminary Results. In *Ninth International Workshop on Information Integration on the Web (IIWeb 2012)*, 2012.
- [56] M. Taheriyani, C. A. Knoblock, P. Szekely, and J. L. Ambite. Semi-Automatically Modeling Web APIs to Create Linked APIs. In *Proceedings of the ESWC 2012 Workshop on Linked APIs*, 2012.
- [57] M. Taheriyani, C. A. Knoblock, P. Szekely, and J. L. Ambite. Rapidly integrating services into the linked data cloud. In *Proceedings of the 11th International Semantic Web Conference (ISWC 2012)*, 2012.
- [58] P. Szekely, R. T. Maheswaran, Y.-H. Chang, Y. Wang, H. Cheng, and K. Singh. Interactive Uncertainty Analysis. In *Proceedings of the 2012 International Conference on Intelligent User Interfaces (IUI 2012), February 14-17, 2012, Lisbon, Portugal*. ACM, 2012.

- [59] C. A. Knoblock, P. Szekely, M. Muslea, and S. Gupta. Mapping Existing Data Sources into VIVO. Aug. 2012.
- [60] C. A. Knoblock, P. Szekely, J. L. Ambite, A. Goel, S. Gupta, K. Lerman, M. Muslea, M. Taheriyani, and P. Mallick. Semi-automatically mapping structured sources into the semantic web. In *Proceedings of the 9th international conference on The Semantic Web: research and applications (ESWC 2012)*, pages 375–390, Berlin, Heidelberg, 2012. Springer-Verlag.
- [61] R. Tuchinda, C. A. Knoblock, and P. Szekely. Building Mashups by Demonstration. *ACM Transactions on the Web (TWEB)*, 5(3):1–45, July 2011.
- [62] P. Szekely, C. A. Knoblock, S. Gupta, M. Taheriyani, and B. Wu. Exploiting Semantics of Web Services for Geospatial Data Fusion. In *Proceedings of the SIGSPATIAL International Workshop on Spatial Semantics and Ontologies (SSO 2011)*, Chicago, IL, 2011.
- [63] R. T. Maheswaran, P. Szekely, and R. Sanchez. Automated Adaptation of Strategic Guidance in Multiagent Coordination. In *Proceedings of the 14th International Conference on Principles and Practice of Multi-Agent Systems (PRIMA 2011)*, Wollongong, Australia, Nov. 2011.
- [64] C. A. Knoblock, P. Szekely, J. L. Ambite, S. Gupta, A. Goel, M. Muslea, K. Lerman, and P. Mallick. Interactively Mapping Data Sources into the Semantic Web. In *Proceedings of the First International Workshop on Linked Science 2011 in Conjunction with the 10th International Semantic Web Conference*, Bonn, Germany, 2011.
- [65] Y. Gil, P. Szekely, S. Villamizar, T. C. Harmon, V. Ratnakar, S. Gupta, M. Muslea, F. Silva, and C. A. Knoblock. Mind Your Metadata: Exploiting Semantics for Configuration, Adaptation, and Provenance in Scientific Workflows. In *Proceedings of the Tenth International Semantic Web Conference (ISWC 2011)*, Bonn, Germany, 2011.
- [66] R. T. Maheswaran, C. M. Rogers, R. Sanchez, and P. Szekely. Towards a General Framework for Human Guidance in Real-Time Multi-Agent Coordination. In *Proceedings of the AAMAS 2010 Workshop on Collaborative Human/AI Control for Interactive Experiences*, Toronto, Canada, May 2010.
- [67] R. T. Maheswaran, C. M. Rogers, R. Sanchez, and P. Szekely. Real-Time Multi-Agent Planning and Scheduling in Dynamic Uncertain Domains. In *Proceedings of the 20th International Conference on Automated Planning and Scheduling (ICAPS 2010 demonstration)*, Toronto, Canada, May 2010.
- [68] R. T. Maheswaran, C. M. Rogers, R. Sanchez, and P. Szekely. Human-Guided Real-Time Multi-Agent Coordination in Dynamic Uncertain Domains. In *Proceedings of the AAMAS 2010 Workshop on Agents in Real-time and Dynamic Environments*, Toronto, Canada, May 2010.
- [69] R. T. Maheswaran, C. M. Rogers, R. Sanchez, and P. Szekely. Human-Agent Collaborative Optimization of Real-Time Distributed Dynamic Multi-Agent Coordination. In *Proceedings of the Third AAMAS 2010 International Workshop on Optimisation in Multi-Agent Systems*, Toronto, Canada, May 2010.

- [70] R. T. Maheswaran, C. M. Rogers, R. Sanchez, and P. Szekely. Enabling Flexible Human Strategic Guidance for Multi-Agent Planning and Scheduling in Dynamic Uncertain Domains. In *Proceedings of the ICAPS 2010 Workshop on Planning and Scheduling Under Uncertainty*, Toronto, Canada, May 2010.
- [71] R. T. Maheswaran, C. M. Rogers, R. Sanchez, and P. Szekely. Decision-Support for Real-Time Multi-Agent Coordination. In *Proceedings of the 9th International Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS 2010 demonstration – Best Demonstration Award)*, Toronto, Canada, May 2010.
- [72] J. Jin and P. Szekely. Interactive Querying of Temporal Data Using A Comic Strip Metaphor. In *Proceedings IEEE Conference on Visual Analytics Science and Technology*, Salt Lake City, Utah, Oct. 2010.
- [73] R. T. Maheswaran, C. M. Rogers, R. Sanchez, P. Szekely, G. Gati, K. Smyth, and C. VanBuskirk. Multi-agent systems for the real world. In C. Sierra, C. Castelfranchi, K. S. Decker, and J. S. Sichman, editors, *8th International Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS 2009), Budapest, Hungary, May 10-15, 2009, Volume 2*, pages 1281–1282. IFAAMAS, 2009.
- [74] R. Maheswaran, C. M. Rogers, R. Sanchez, P. Szekely, G. Gati, K. Smyth, and C. VanBuskirk. Multi-agent systems for the real world. In *Proceedings of The 8th International Conference on Autonomous Agents and Multiagent Systems (AAMAS 2009)*. International Foundation for Autonomous Agents and Multiagent Systems, May 2009.
- [75] J. Jin and P. Szekely. QueryMarvel: A visual query language for temporal patterns using comic strips. In *VL/HCC*, pages 207–214, Washington, DC, USA, 2009. IEEE.
- [76] H. C. H. Chiu, B. Ryu, H. Zhu, P. Szekely, R. T. Maheswaran, C. M. Rogers, A. Galstyan, B. Salemi, M. Rubenstein, and W.-M. Shen. TENTACLES: Self-configuring robotic radio networks in unknown environments. In *IROS*, pages 1383–1388. IEEE, 2009.
- [77] R. Tuchinda, P. Szekely, and C. A. Knoblock. Building Mashups by Example. In J. M. Bradshaw, H. Lieberman, and S. Staab, editors, *Proceedings of the 2008 International Conference on Intelligent User Interfaces (IUI 2008), January 13-16, 2008, Gran Canaria, Canary Islands, Spain*, pages 139–148, New York, NY, USA, 2008. ACM.
- [78] R. Sanchez, J. Jin, R. T. Maheswaran, and P. Szekely. Interfaces for team coordination. In J. M. Bradshaw, H. Lieberman, and S. Staab, editors, *Proceedings of the 2008 International Conference on Intelligent User Interfaces (IUI 2008), January 13-16, 2008, Gran Canaria, Canary Islands, Spain*, pages 427–428. ACM, 2008.
- [79] R. T. Maheswaran, P. Szekely, M. Becker, S. Fitzpatrick, G. Gati, J. Jin, R. Neches, N. Noori, C. Rogers, R. Sanchez, K. Smyth, and C. VanBuskirk. Predictability & criticality metrics for coordination in complex environments. In R. T. Maheswaran, P. A. Szekely, M. Becker, S. Fitzpatrick, G. Gati, J. Jin, R. Neches, N. Noori, C. Rogers, R. Sanchez, K. Smyth, and C. VanBuskirk, editors, *Proceedings of the 7th international joint conference on Autonomous agents and multiagent systems (AAMAS 2008)*, pages 647–654. International Foundation for Autonomous Agents and Multiagent Systems, May 2008.

- [80] R. T. Maheswaran and P. Szekely. Criticality Metrics for Distributed Plan and Schedule Management. In J. Rintanen, B. Nebel, J. C. Beck, and E. A. Hansen, editors, *Proceedings of the Eighteenth International Conference on Automated Planning and Scheduling (ICAPS 2008)*, Sydney, Australia, September 14-18, 2008, pages 214–221. AAAI, 2008.
- [81] C. A. Knoblock, J. L. Ambite, M. Carman, M. Michelson, P. Szekely, and R. Tuchinda. Beyond the Elves: Making Intelligent Agents Intelligent. *AI Magazine*, 29(2):33–42, 2008.
- [82] J. Jin, R. Sanchez, R. T. Maheswaran, and P. Szekely. VizScript: on the creation of efficient visualizations for understanding complex multi-agent systems. In J. M. Bradshaw, H. Lieberman, and S. Staab, editors, *Proceedings of the 2008 International Conference on Intelligent User Interfaces (IUI 2008)*, January 13-16, 2008, Gran Canaria, Canary Islands, Spain, pages 40–49. ACM, 2008.
- [83] R. Tuchinda, P. Szekely, and C. A. Knoblock. Building Data Integration Queries by Demonstration. In *Proceedings of the 12th international conference on Intelligent user interfaces (IUI 2007)*, pages 170–179, 2007.
- [84] J. Jin, R. T. Maheswaran, R. Sanchez, and P. Szekely. VizScript: visualizing complex interactions in multi-agent systems. In J. Jin, R. T. Maheswaran, R. Sanchez, and P. A. Szekely, editors, *Proceedings of the 12th international conference on Intelligent user interfaces (IUI 2007)*, pages 369–372. ACM Request Permissions, Jan. 2007.
- [85] T. Harbers, R. T. Maheswaran, and P. Szekely. Centralized, Distributed or Something Else? Making Timely Decisions in Multi-Agent Systems. In *AAAI 2007*, pages 738–743. AAAI Press, 2007.
- [86] P. Szekely, R. Maheswaran, R. Neches, C. Rogers, R. Sanchez, M. Becker, S. Fitzpatrick, G. Gati, D. Hanak, G. Karsai, and C. van Buskirk. An Examination of Criticality-Sensitive Approaches to Coordination. In *In AAAI Spring Symposium on Distributed Plan and Schedule Management*, pages 136–142. AAAI Press, 2006.
- [87] P. Szekely, M. Becker, S. Fitzpatrick, G. Gati, D. Hanak, J. Jin, G. Karsai, R. T. Maheswaran, R. Neches, C. M. Rogers, R. Sanchez, and C. P. van Buskirk. CSC: Criticality-Sensitive Coordination. In H. Nakashima, M. P. Wellman, G. Weiss, and P. Stone, editors, *5th International Joint Conference on Autonomous Agents and Multiagent Systems (AAMAS 2006)*, Hakodate, Japan, May 8-12, 2006, pages 1441–1442. ACM, 2006.
- [88] P. Szekely, M. Becker, S. Fitzpatrick, G. Gati, D. Hanak, J. Jin, G. Karsai, R. T. Maheswaran, B. Neches, C. M. Rogers, R. Sanchez, and C. van Buskirk. CSC: Criticality-Sensitive Coordination. In *Proceedings of the fifth international joint conference on Autonomous agents and multiagent systems (AAMAS 2006)*. ACM, May 2006.
- [89] R. T. Maheswaran, C. M. Rogers, R. Sanchez, P. A. Szekely, and P. Chen. Scaling in Domains with Uncertainty: Criticality-Sensitive Coordination. In *In Proceedings of the AAMAS 2006 Workshop on Massively Multiagent Systems / Large-Scale Multiagent Systems*, Hakodate, Japan, May 2006.
- [90] R. T. Maheswaran, C. M. Rogers, R. Sanchez, P. A. Szekely, and P. Chen. Distributed Scheduling for Multi-Agent Teamwork in Uncertain Domains: Criticality-Sensitive Coordination. In *In*

Proceedings of the AAMAS 2006 Workshop on Multiagent Sequential Decision Making, Hakodate, Japan, May 2006.

- [91] B. T. Vander Zanden, R. L. Halterman, B. A. Myers, R. C. Miller, P. Szekely, D. A. Giuse, D. S. Kosbie, and R. G. McDaniel. Lessons learned from programmers' experiences with one-way constraints. *Softw, Pract. Exper*, 35(13):1275–1298, 2005.
- [92] P. Szekely, R. Neches, M. Becker, S. Fitzpatrick, C. van Buskirk, D. Fisher, and G. Karsai. Plan Execution and Coordination. In *Proceedings of ICAPS Workshop: Plan Execution: A Reality Check*, Monterey, California, June 2005.
- [93] R. Neches and P. Szekely. CAMERA: Coordination and Management Environments for Responsive Agents, Project Final Report. Technical report, 2005.
- [94] C. A. Knoblock, P. Szekely, and R. Tuchinda. A Mixed-Initiative System for Building Mixed-Initiative Systems. In *Proceedings of the AAAI Fall Symposium on Mixed-Initiative Problem-Solving Assistants*, 2005.
- [95] M. Cai, M. Frank, J. Chen, and P. Szekely. MAAN: A Multi-Attribute Addressable Network for Grid Information Services. *Journal of Grid Computing*, 2(1):184–191, 2004.
- [96] B. Yan, M. R. Frank, P. Szekely, R. Neches, and J. Lopez. WebScripter: Grass-Roots Ontology Alignment via End-User Report Creation. In D. Fensel, K. P. Sycara, and J. Mylopoulos, editors, *The Semantic Web, Second International Semantic Web Conference (ISWC 2003), Sanibel Island, FL, USA, October 20-23, 2003, Proceedings*, pages 676–689. Springer, 2003.
- [97] J. Chen, R. Bugacov, P. Szekely, M. Frank, M. Cai, D. Kim, and R. Neches. Coordinated Aggressive Bidding in Distributed. In *In Proceedings of the AAMAS 2003 Workshop on Representations and Approaches for Time-critical Decentralized Resource/Role/Task Allocation*, Melbourne, Australia, July 2003.
- [98] M. Cai, M. Frank, J. Chen, and P. Szekely. Maan: a multi-attribute addressable network for grid information services. pages 184 – 191, nov. 2003.
- [99] M. R. Frank, P. A. Szekely, R. Neches, B. Yan, and J. Lopez. WebScripter: World-Wide Grass-roots Ontology Translation via Implicit End-User Alignment. In M. Frank, N. F. Noy, and S. Staab, editors, *Proceedings of the WWW2002 International Workshop on the Semantic Web, Hawaii, May 7, 2002*. CEUR-WS.org, 2002.
- [100] C. Wiecha and P. Szekely. Transforming the UI for anyone. anywhere: enabling an increased variety of users, devices, and tasks through interface transformations. In *Proceedings of ACM CHI 2001 Conference on Human Factors in Computing Systems*, pages 483–484, 2001.
- [101] B. T. Vander Zanden, R. Halterman, B. A. Myers, R. McDaniel, R. Miller, P. Szekely, D. A. Giuse, and D. Kosbie. Lessons learned about one-way, dataflow constraints in the Garnet and Amulet graphical toolkits. *Transactions on Programming Languages and Systems (TOPLAS)*, 23(6):776–796, Nov. 2001.
- [102] P. Szekely, Rogers, C. Milo, and M. Frank. Interfaces for Understanding Multi-Agent Behavior. In *Proceedings of the 2001 International Conference on Intelligent User Interfaces (IUI 2001)*, pages 161–166, 2001.

- [103] J. Lopez and P. A. Szekely. Web page adaptation for universal access. In C. Stephanidis, editor, *Universal Access In HCI: Towards an Information Society for All, Proceedings of HCI International '2001 (the 9th International Conference on Human-Computer Interaction), New Orleans, USA, August 5-10, 2001, Volume 3*, pages 690–694. Lawrence Erlbaum, 2001.
- [104] J. Lopez and P. Szekely. Automatic Web Page Adaptation. In *Proceedings of the CHI-2001 Workshop Transforming the UI for anyone, anywhere*, Seattle, Washington, Apr. 2001.
- [105] M. Frank, A. Bugacov, J. Chen, G. Dakin, P. Szekely, and B. Neches. The Marbles Manifesto: A Definition and Comparison of Cooperative Negotiation Schemes for Distributed Resource Allocation. In *In Proceedings of the 2001 AAI Fall Symposium on Negotiation Methods for Autonomous Cooperative Systems*, pages 36–45, 2001.
- [106] P. A. Szekely, C. G. Thomas, and M. T. Maybury. Editorial: IUI 99. *Knowl.-Based Syst*, 12(8):401–402, 1999.
- [107] P. Szekely, B. Neches, D. Benjamin, J. Chen, and C. M. Rogers. DEALMAKER: An Agent for Selecting Sources of Supply To Fill Orders. In *In Proceedings of the Agents'99 workshop on Agent-based Decision-Support for Managing the Internet-Enabled Supply Chain*, Seattle, Washington, May 1999.
- [108] P. Szekely, B. Neches, D. Benjamin, J. Chen, and C. M. Rogers. Controlling Supplier Selection in an Automated Purchasing System. In *In Proceedings of the AAAI'99 Workshop on AI in Electronic Commerce (AIEC'99)*, Menlo Park, California, June 1999. AAAI Press.
- [109] M. Frank and P. Szekely. Collapsible User Interfaces for Information Retrieval Agents. In *Proceedings of the 4th international conference on Intelligent user interfaces (IUI 1999)*, pages 15–22, Los Angeles, CA, USA, 1999. ACM.
- [110] P. Castells and P. A. Szekely. Presentation Models by Example. In D. J. Duke and A. R. Puerta, editors, *Design, Specification and Verification of Interactive Systems'99, Proceedings of the Eurographics Workshop in Braga, Portugal, June 2-4, 1999*, pages 100–116. Springer, 1999.
- [111] P. Castells and P. A. Szekely. HandsOn: Dynamic Interface Presentations by Example. In H.-J. Bullinger and J. Ziegler, editors, *Human-Computer Interaction: Ergonomics and User Interfaces, Proceedings of HCI International '99 (the 8th International Conference on Human-Computer Interaction), Munich, Germany, August 22-26, 1999, Volume 1*, pages 1288–1292. Lawrence Erlbaum, 1999.
- [112] F. Saiz, P. Szekely, and P. Devang. Customized Web-Based Data Presentation. In H. A. Maurer and R. G. Olson, editors, *Proceedings of WebNet 98 - World Conference on the WWW and Internet Intranet, Orlando, Florida, USA, November 7-12, 1998*. AACE, 1998.
- [113] M. R. Frank and P. Szekely. Adaptive Forms: An Interaction Paradigm for Entering Structured Data. In *Proceedings of the 3rd international conference on Intelligent user interfaces (IUI 1998)*, pages 153–160, San Francisco, California, United States, Jan. 1998. ACM.
- [114] P. Castells, P. Szekely, and E. Salcher. Declarative Models of Presentation. In *Proceedings of the 2nd international conference on Intelligent user interfaces (IUI 1997)*, pages 137–144, Orlando, Florida, United States, 1997. ACM.

- [115] P. A. Szekely. Retrospective and Challenges for Model-Based Interface Development. In F. Bodart and J. Vanderdonckt, editors, *Design, Specification and Verification of Interactive Systems'96, Proceedings of the Third International Eurographics Workshop, June 5-7, 1996, Namur, Belgium*, pages 1–27. Springer, 1996.
- [116] P. Szekely, P. N. Sukaviriya, P. Castells, J. Muthukumarasamy, and E. Salcher. Declarative Interface Models for User Interface Construction Tools: the MASTERMIND Approach. In L. J. Bass and C. Unger, editors, *Engineering for Human Computer Interaction (EHCI)*, pages 120–150. Chapman and Hall, 1995.
- [117] B. Vander Zanden, B. A. Myers, D. A. Giuse, and P. Szekely. Integrating pointer variables into one-way constraint models. *Transactions on Computer-Human Interaction (TOCHI)*, 1(2):161–213, June 1994.
- [118] P. A. Szekely. User Interface Prototyping: Tools and Techniques. In R. N. Taylor and J. Coutaz, editors, *ICSE Workshop on SE-CHI*, pages 76–92. Springer, 1994.
- [119] P. Szekely. Interactive Specification of Context-Sensitive Displays in Humanoid. Technical report, 1994.
- [120] A. R. Puerta, R. Neches, H. Eriksson, P. Szekely, P. Luo, and M. A. Musen. Toward Ontology-Based Frameworks for Knowledge-Acquisition Tools. In *In Proceedings of the Eighth Knowledge Acquisition Workshop for Knowledge-Based Systems*, 1994.
- [121] A. Puerta and P. Szekely. Model-Based Interface Development. In *Tutorial Notes, ACM CHI'94 Conference on Human Factors in Computing Systems*, pages 389–390, 1994.
- [122] R. Moriyon, P. Szekely, and R. Neches. Automatic Generation of Help from Interface Design Models. In *Proceedings of ACM CHI'94 Conference on Human Factors in Computing Systems*, pages 225–231, 1994.
- [123] P. Szekely, P. Luo, and R. Neches. Beyond Interface Builders: Model-Based Interface Tools. In *CHI '93: Proceedings of the INTERACT '93 and CHI '93 conference on Human factors in computing systems*, pages 383–390, 1993.
- [124] R. Neches, J. Foley, P. Szekely, P. Sukaviriya, P. Luo, S. Kovacevic, and S. Hudson. Knowledgeable Development Environments Using Shared Design Models. In *Proceedings of the 1993 International Workshop on Intelligent User Interfaces*, pages 63–70, 1993.
- [125] R. Neches, P. Aberg, D. Benjamin, B. Harp, L. Hu, P. Luo, R. Moriyon, and P. Szekely. The Integrated User-Support Environment (IN-USE) Group at USC/ISI. In *CHI '93: Proceedings of the INTERACT '93 and CHI '93 conference on Human factors in computing systems*, pages 53–54, New York, NY, USA, 1993. ACM.
- [126] P. Luo, P. Szekely, and R. Neches. Management of Interface Design in HUMANOID. In *CHI '93: Proceedings of the INTERACT '93 and CHI '93 conference on Human factors in computing systems*, pages 107–114, New York, NY, USA, 1993. ACM.
- [127] P. Szekely, P. Luo, and R. Neches. Facilitating the Exploration of Interface Design Alternatives: The HUMANOID Model of Interface Design. In *Proceedings of ACM CHI'92 Conference on Human Factors in Computing Systems*, pages 507–515, 1992.

- [128] Zanden, B. Vander, Myers, B. A. D. Giuse, and P. Szekely. The Importance of Pointer Variables in Constraint Models. In J. R. Rhyne, editor, *Proceedings of the 4th Annual ACM Symposium on User Interface Software and Technology (UIST 1991), Hilton Head, South Carolina, USA, November 11-13, 1991*, pages 155–164. ACM, 1991.
- [129] P. Szekely. Template-based mapping of application data interactive displays. In S. E. Hudson, editor, *Proceedings of the 3rd Annual ACM Symposium on User Interface Software and Technology (UIST 1990), Snowbird, Utah, USA, October 3-5, 1990*, pages 1–9. ACM, 1990.
- [130] P. Szekely. Standardizing the Interface Between Applications and UIMSs. In *Proceedings of the 2nd annual ACM Symposium on User Interface Software and Technology (UIST 1989)*, pages 34–42. ACM, 1989.
- [131] P. Szekely and B. Myers. A user interface toolkit based on graphical objects and constraints. *ACM SIGPLAN Notices*, 23(11):36–45, 1988.
- [132] P. Szekely. Using classification and separation to build intelligent interfaces. *SIGCHI Bull.*, 20(1):76–77, July 1988.
- [133] P. Szekely. Modular implementation of presentations. *SIGCHI Bull.*, 18(4):235–240, 1987.
- [134] P. Szekely. Separating the user interface from the functionality of application programs. *SIGCHI Bulletin*, 18(2), Oct. 1986.
- [135] P. J. Hayes, P. Szekely, and R. A. Lerner. Design alternatives for user interface management systems based on experience with COUSIN. In *CHI'85: Proceedings of the SIGCHI conference on Human factors in computing systems*. ACM Request Permissions, Apr. 1985.
- [136] P. J. Hayes and P. Szekely. Graceful Interaction Through the COUSIN Command Interface. *International Journal of Man-Machine Studies*, 19(3):285–306, 1983.