Matthew E. Klenk

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Education

- **Northwestern University**, Evanston, IL. 6/09
  Ph.D., Department of Electrical Engineering and Computer Science
  Dissertation: Robustness in Reasoning and Learning by Analogy
  Advisor: Ken Forbus
  Committee: Ken Forbus, Chris Riesbeck, John Laird, Thomas Hinrichs
- **Northwestern University**, Evanston, IL. 12/06
  M.S., Department of Electrical Engineering and Computer Science
- **Emory University**, Atlanta, GA. 5/03
  B.A., Computer Science

Employment

- Research Scientist 2/11 - Present
  Palo Alto Research Center, Palo Alto, CA
- NRC Postdoctoral Research Associate 4/09 – 2/11
  Adaptive Systems Section, AI Center, Naval Research Laboratory, Washington, DC
- Graduate Research Assistant 9/04 - 4/09
  Qualitative Reasoning Group, Northwestern University, Evanston, IL
- Software Developer 1/03 - 8/03
  Hannon Hill, Atlanta, GA

Publications pdf's are available at http://www.matthewklenk.com/

Dissertation

1. Klenk, M. (2009). Using *Analogy to Overcome Brittleness in AI Systems* (Tech. Rep. No. NWU-EECS-09-09). Doctoral dissertation, Northwestern University, Department of Electrical Engineering and Computer Science, Evanston, IL.

Journals

1. Klenk, M., and Forbus, K. (2013). Analogical Learning across Four Physics Domains. *Artificial Intelligence*. Elsevier.
2. Klenk, M., Molineaux, M., and Aha, D. (2013). Goal-Driven Autonomy for responding to unexpected events in complex environments. *Computational Intelligence.* Wiley-Blackwell.
3. Klenk, M., Forbus, K., Tomai, E., and Kim, H. (2011). Using Analogical Model Formulation with Sketches to Solve Bennett Mechanical Comprehension Test Problems. *Journal Experimental and Theoretical Artificial Intelligence*, Special Issue on "Test-Based AI". Taylor & Francis.

4. Klenk, M., Aha, D. and Molineaux, M. (2011). Making the case for transfer: Case-based transfer learning. *AI Magazine*. AAAI Press.
5. Aha, D.W., Molineaux, M., & Klenk, M. (2011). Goal-driven autonomy. In *2011 NRL Review*. pp. 154-155.
6. Klenk, M. and Forbus, K. (2009). Analogical Model Formulation for Transfer Learning in AP Physics. *Artificial Intelligence*. Elsevier.
7. Klenk, M. and Forbus, K. (2009). Domain Transfer via Cross-Domain Analogy. *Cognitive Systems Research*, Special Issue on "Analogies: Integrating Cognitive Abilities". Elsevier.
8. Forbus, K., Klenk, M., and Hinrichs, T. (2009). Companion Cognition Systems: Design Goals and Some Lessons Learned. *IEEE-Intelligent Systems*, Special Issue on "Human-level Intelligence"

Conferences

1. Klenk, M., de Kleer, J., Bobrow, D. G., and Janssen, B. (2014). Making Modelica Applicable for Formal Methods. In *Proceedings of the 10th International Modelica Conference*. Lund, Sweden
2. Lattmann, Z.; Pop, A.; de Kleer, J.; Fritzson, P.; Janssen, B.; Neema, S.; Bapty, T.; Koutsoukos, X.; Klenk, M.; Bobrow, D.; Saha, B.; and Kurtoglu, T. (2014). Verification and design Exploration through Meta tool integration with OpenModelica. In *Proceedings of the 10th International Modelica Conference*. Lund, Sweden
3. Lockwood, K.; Kelleher, J. D.; Klenk, M.; and Hawes, N. (2013). The Role of Context in Spatial Region Identification. In *Proceedings of Second Annual Conference on Advances in Cognitive Systems* (Poster Collection), Baltimore, MD, 2013.
4. Klenk, M., de Kleer, J., Bobrow, D. G.; Yoon, S., Hanley, J., and Janssen, B. (2012). Guiding and Verifying Early Design Using Qualitative Simulation. In *Proceedings of the ASME 2012 IDETC and CIE*, Chicago, IL
5. Hawes, N., Klenk, M., Lockwood, K., Horn, G., and Kelleher, J. (2012). Towards a Cognitive System That Can Recognize Spatial Regions Based on Context. In *Proceedings of Twenty-Sixth AAAI Conference on Artificial Intelligence (AAAI-12)*. Toronto, ON. 26% acceptance rate.
6. Molineaux, M., Kuter, U., & Klenk, M. (2012). DiscoverHistory: Understanding the Past in Planning and Execution. In *Proceedings of the Eleventh International Conference on Autonomous Agents and Multi-Agent Systems*. Valencia, Spain.
7. Molineaux, M., Klenk, M., and Aha, D. (2010). Planning in dynamic environments: Extending HTNs with nonlinear continuous effects. In *Proceedings of Twenty-Fourth AAAI Conference on Artificial Intelligence (AAAI-10)*. Atlanta, GA. 26% acceptance rate.
8. Molineaux, M., Klenk, M., and Aha, D. (2010). Goal-driven autonomy in a navy training simulation. In *Proceedings of Twenty-Fourth AAAI Conference on Artificial Intelligence (AAAI-10)*. Atlanta, GA. 29% acceptance rate (special track on Integrated Intelligence).
9. Munoz-Avila, H., Aha, D.W., Jaidee, U., Klenk, M., and Molineaux, M. (2010). Applying goal directed autonomy to a team shooter game. In *Proceedings of the Twenty-Third Florida Artificial Intelligence Research Society Conference*.
10. Klenk, M. and Forbus, K. (2009). Persistent Mappings in Cross-Domain Analogical Learning of Physics Domains. *Proceedings of the 2nd International Analogy Conference*. Sofia, Bulgaria.

11. Dehghani, M., Tomai, E., Forbus, K., and Klenk, M. (2008). An Integrated Reasoning Approach to Moral Decision-Making. *Proceedings of AAAI-08: 23rd National Conference on Artificial Intelligence*. Chicago, IL. 24% acceptance rate.
12. Dehghani, M., Tomai, E., Forbus, K., Iliev, R., and Klenk, M. (2008). MoralDM: A Computational Modal of Moral Decision-Making. *Proceedings of the 30th Annual Conference of the Cognitive Science Society (CogSci-08)*, Washington, D.C.
13. Klenk, M. and Forbus, K. (2007). Measuring the level of transfer learning by an AP Physics problem-solver. *Proceedings of AAAI-07: 22nd National Conference on Artificial Intelligence*, Vancouver, BC. 27% acceptance rate.
14. Klenk, M. and Forbus, K. (2007). Cognitive modeling of analogy events in physics problem solving from examples. *Proceedings of the 29th Annual Conference of the Cognitive Science Society (CogSci-07)*. Nashville, TN.
15. Paritosh, P.K. and Klenk, M. (2006). Cognitive Processes in Quantitative Estimation: Analogical Anchors and Causal Adjustment. *Proceedings of the 28th Annual Conference of the Cognitive Science Society (CogSci-06)*. Vancouver, Canada.
16. Klenk, M., Forbus, K., Tomai, E., Kim,H., and Kyckelhahn, B. (2005). Solving Everyday Physical Reasoning Problems by Analogy using Sketches. *Proceedings of AAAI-05: 20th National Conference on Artificial Intelligence*, Pittsburgh, USA. 18% acceptance rate.

Workshops and Symposia

1. Klenk, M., de Kleer, J. Bobrow, D., and Matei, I. (2015). But where do we start? Qualitative initialization problem with quantitative models. *Proceedings of the 28th International Workshop on Qualitative Reasoning.* Minneapolis, MN, USA.
2. Vattam, S.; Klenk, M.; Molineaux, M.; Aha; and W, D. (2013). Breadth of Approaches to Goal Reasoning: A Research Survey. *Goal Reasoning Workshop at Advances in Cognitive Systems*. Baltimore, MD, 2013.
3. Klenk, M.; and Bobrow, D. (2013). Dynamic Symbol Grounding: Changing Referents in Engineering Analysis and Spatial Environments. In *Procceedings of the AAAI-13 Workshop on Space, Time, and Ambient Intelligence*, Bellevue, WA, 2013.
4. Klenk, M., de Kleer, J., Bobrow, G, D., and Janssen, B. (2013). Using Modelica Models for Qualitative Reasoning. In *Proceedings of the 27th Annual Workshop on Qualitative Reasoning (QR13)*, Bremen, Germany.
5. Klenk, M., Bobrow, D., de Kleer, J., Hanley, J., and Janssen, B. (2012) Placing Qualitative Reasoning in the Design Process. In *Proceedings of the 26th International Workshop on Qualitative Reasoning*. Playa Vista, CA.
6. Bobrow, D., Klenk, M., de Kleer, J., Janssen, B., and Hanley, J. (2012) Challenges for Qualitative Reasoning in a Design. In *Proceedings of the 26th International Workshop on Qualitative Reasoning*. Playa Vista, CA.
7. Hawes, N., Klenk, M., Lockwood, K., Horn, G., and Kelleher, J. (2012). Using Anchor Points to Define and Transfer Spatial Regions Based on Context. In *Proceedings of the 26th International Workshop on Qualitative Reasoning*. Playa Vista, CA.

8. Klenk, M., Hawes, N., and Lockwood, K. (2011). Representing and Reasoning About Spatial Regions Defined by Context. in *AAAI Fall Symposium Series on Advances in Cognitive Systems*. Washington, DC.
9. Gupta, K., Schneider, A., Klenk, M., Gillespie, K., and Karneeb, J. (2011). Representing and Reasoning with Functional Knowledge for Spatial Language Understanding. In *CogSci Workshop on Computational Models for Spatial Language Interpretation and Generation*. Boston, MA.
10. Molineaux, M. Kutur, U., and Klenk, M. (2011). What Just Happened? Explaining the Past in Planning and Execution. To appear in T. Roth-Berghofer, N. Tintarev, & D.B. Leake (Eds.) *Explanation-Aware Computing: Papers from the IJCAI Workshop*. Barcelona, Spain
11. Klenk, M. (2010). Goal-Driven Autonomy in Planning and Acting. *AAAI-10 Workshop on Goal directed Autonomy*. Atlanta, GA.
12. Klenk, M. (2009). Transfer as a Benchmark for Multi-Representational Architectures. *AAAI Fall Symposium on Multi-Representational Architectures*, Washington, DC.
13. Laviers, K., Sukthankar, G., Klenk, M., Aha, D., and Molineaux, M. (2009). Opponent Modeling and Spatial Similarity to Retrieve and Reuse Superior Plays. *ICCBR Workshop on Case-Based Reasoning for Computer Games.* Seattle, WA.
14. Forbus, K., Hinrichs, T., and Klenk, M. (2008). Companion Cognitive Systems: Design Goals and Some Lessons Learned. *AAAI Fall Symposium on Naturally-Inspired Artificial Intelligence*, Washington, DC.
15. Dehghani, M., Tomai, E., Forbus, K., Iliev, R., and Klenk, M. (2008). MoralDM: A Computational Modal of Moral Decision-Making. Abstract accepted at the 2008 meeting of Society of Judge and Decision Making (SJDM). Chicago, IL.
16. Klenk, M., Friedman, S., and Forbus, K. (2008). Learning Modeling Abstractions via Generalization. *22nd International Workshop on Qualitative Reasoning*. Boulder, CO.
17. Dehghani, M., Tomai, E., Forbus, K., and Klenk, M. (2008). Order of Magnitude Reasoning in Modeling Moral Decision-Making. *22nd International Workshop on Qualitative Reasoning*. Boulder, CO.
18. Klenk, M. and Forbus, K. (2007). Cross domain analogies for learning domain theories. In Angela Schwering et al. (Eds.), *Analogies: Integrating Multiple Cognitive Abilities*. Publications of the Institute of Cognitive Science, University of Osnabrück, Volume 5-2007
19. Klenk, M. and Forbus, K. (2007). Learning domain theories via analogical transfer. *Proceedings of 21st International Workshop on Qualitative Reasoning Workshop*. Aberystwyth, U.K.
20. Klenk, M. and Forbus, K. (2006). Analogical Model Formulation for AP Physics Problems. *20th International Workshop on Qualitative Reasoning*. Hanover, USA.
21. Klenk, M., Forbus, K., Tomai, E., Kim,H., and Kyckelhahn, B. (2005). Solving Everyday Physical Reasoning Problems by Analogy using Sketches. *Proceedings of 19th International Workshop on Qualitative Reasoning*. Graz, Austria.
22. Forbus, K., Lockwood, K., Klenk, M., Tomai, E., and Usher, J. (2004). Open-domain sketch understanding: The nuSketch approach. *AAAI Fall Symposium on Making Pen-based Interaction Intelligent and Natural*, Washington, DC, USA.

Other Publications

1. Klenk, M. June 22nd, 2009. *My Computer, My Collaborator*. The AI Report on Forbes.com. Available at http://www.forbes.com/ai/

Awards

- National Research Council Postdoctoral Fellowship 2009-2011
- Walter P. Murphy Chair Fellowship 2007-2008
- Helen and Robert J. Piros Fellowship 2003-2004

Professional Affiliations and Activities

Conference Program Chair

- 2nd Annual Conference on Advances in Cognitive Systems. 2013.

Workshop Chair

- 26th International Qualitative Reasoning Workshop. Marina Del Rey, CA. 2012

Conference Program Committee

- Cognitive Science Conference. 2010-2014.
- Association for the Advancement of Artificial Intelligence. 2012-6.
- International Analogy Conference. 2009.

Workshop Program Committee

- ACS-2013 Goal Reasoning Workshop
- AAAI-2014 Spring Symposium on Qualitative Representations for Robotics
- SAMAI-12 1st International Workshop on Similarity and Analogy-based Methods in AI
- STeDy-12 Spatio-Temporal Dynamics
- AAAI-2010 Workshop on Goal-Directed Autonomy

Invited Talks

- "Goal-Driven Autonomy in Strategy Simulations"
  - **KOCSEA Technical Symposium**, Vienna, VA. November 2010.
- "Alleviating Knowledge Brittleness through Analogical Reasoning and Learning"
  - **George Mason University**, Vienna, VA. AI Seminar. June 2010.
  - **Lehigh University**, Bethlehem, PA. Hector Munoz-Avila's research group. May 2010.