

Nils Krahnstoeber, Ph.D.

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PROFESSIONAL EXPERIENCE

- May 2011 **Software Engineer**
Google, Cambridge, MA, USA
- August 2003 – April 2011 **Senior Scientist, Real-Time Computer Vision and Interactive Visualization**
General Electric Global Research, Visualization and Computer Vision Lab, Niskayuna, NY, USA
- Principal Investigator and technical contributor on research programs for GE Security, NBC Universal, National Institute of Justice (NIJ), Department of Homeland Security (DHS) and Department of Defense (DOD). Research focus: visual surveillance, security, multimedia, visualization, multimodal systems. Special emphasis on large-scale real-time computer vision systems.
- Aug 99 – Apr 00 **Research Assistant -** *Computer Vision Group, Penn State University*
May 01 – July 03
- Research in multimodal human computer interface systems. Developed a methodology for automatic acquisition and initialization of articulated models for model-based tracking. Developed a hidden Markov model based gesture recognition engine. Designed software framework for large-screen multimodal interaction using speech recognition, continuous gesture recognition, speech-gesture fusion and robust motion tracking.
- May 00 - May 01 **Director of Computer Vision Research -** *Advanced Interface Technologies (now Video Mining)*
- Participated in investor and fund-raiser meetings across the US. Directed the computer vision research that created robust real-time algorithms for vision-based multimodal speech gesture interface systems.
- May 99 – Aug 99 **Research Assistant -** *Computer Vision Group, Penn State University*
- Research in augmented reality (AR). Developed prototype AR system on SGI Onyx 10000.
- May 98 – Aug 98 **Intern and Research Consultant –** *PHILIPS Research, Medical Image Processing, Hamburg*
- Developed a solution to the correspondence problem in statistical shape-modeling using a landmark based template warping approach. Advisor: Dr. Cristian Lorenz.
Developed a fundamentally new approach for robust, fast and curvature adaptive triangulation of medical image data using Voronoi-based discrete surface approximations of Delaunay graphs.

EDUCATION

- 1998-2003 **Ph.D. Computer Science**
The Pennsylvania State University, University Park, PA, USA.
Thesis: "Acquiring Articulated Models from Video". Advisor: Prof. Rajeev Sharma
- 1994-1998 **M.S. in Physics (German "Diplom")**
Christian-Albrecht University, Kiel, Germany.
Thesis: "Controlling Chaos in the Pierce Diode". Advisors: Prof. Dr. A. Piel, Prof. Dr. T. Klinger
- 1995-1996 **Exchange Scholarship - Graduate studies in Physics and Mathematics**
The Pennsylvania State University, University Park, PA, USA
- 1992-1994 **Vordiplom Physics (German Candidacy for M.S.)**
Christian-Albrecht University, Kiel, Germany

PROFESSIONAL ACTIVITIES / COURSES

Member: IEEE, IEEE Computer Society, ACM, DPG (German Physics Society)

Reviewer: IEEE Transaction on Pattern Analysis and Machine Intelligence
IEEE Transaction on Image Processing
Journal on Image and Vision Computing
Journal on Machine Vision and Application
Pattern Recognition
IEEE International Conference on Advanced Video and Signal Based Surveillance (AVSS)
IEEE International Conference on Computer Vision (ICCV)
IEEE International Conference on Pattern Recognition (ICPR)
Workshop on Applications of Computer Vision (WACV)
European Conference of Computer Vision (ECCV)
EURASIP Journal on Image and Video Processing

Courses: Six Sigma Green Belt (DMAIC, DFSS)
GE Fundamentals for Technologists (FFT) Course
GE Four Stages Workshop
GE Behavioral Based Interviewing

TEACHING

1999 **Artificial Intelligence** - Teaching Assistant - Senior undergraduate level.

1998 **Introduction to Computer Science** - Teaching Assistant - Undergraduate level.

1997 **Theoretical Statistical Physics** - Teaching Assistant - Graduate level.

1996-1997 **Theoretical Mechanics (Physics)** - Teaching Assistant - Senior undergraduate level.

INVITED PRESENTATIONS AND TALKS

2011 "Visualization and Intelligent Video", SCI Institute, U Utah

2010 "Intelligent Video", Boston University, Computer Science Department

2010 Invited speaker and panelist at NIJ Conference Panel: "CCTV Systems: Do they work? How can they be made more effective?", NIJ Conference 2010, Washington DC

2010 Exhibit at Technical Incident Preparedness Conference (TCIP)

2010 "Intelligent Video", Syracuse University, Computer Science Department

2009 Detection and Prevention of Criminal Activities, NIJ Technical Working Group Meeting, Tampa, FL

2008 Keynote presentation "Applications and challenges for multi-camera and multi-sensor vision systems", Workshop on Multi-camera and Multi-modal Sensor Fusion Algorithms and Applications (M2SFA2)

2008 Visual Surveillance, National Sensor, Surveillance and Biometric Technologies Center Of Excellence, New York City, New York

2008 Automated Detection and Prevention of Criminal Activities, 10th Annual Technologies for Critical Incident Preparedness Conference & Exposition (Exhibit Presentation)

2007 Toward Detection and Prevention of Criminal Activities, NIJ Technical Working Group Meeting

2006 McGill University, Montreal, Canada

2006 University of Maryland

2005 Robotics Institute, Carnegie Mellon University

2005 ETH Zurich, Switzerland

PUBLICATIONS

Journal Papers

1. N. Krahnstoever and C. Lorenz. Computing curvature-adaptive surface triangulations of three-dimensional image data. *Vis. Comput.*, 20(1):17–36, Springer-Verlag New York, Inc., Secaucus, NJ, USA, 2004.
2. R. Sharma, M. Yeasin, N. Krahnstoever, I. Rauschert, G. Cai, I. Brewer, A. MacEachren, and K. Sengupta. Speech-Gesture Driven Multimodal Interfaces for Crisis Management. *Proceedings of the IEEE*, 91(9):1327, September 2003.
3. N. Krahnstoever, M. Yeasin, and R. Sharma. Automatic Acquisition and Initialization of Articulated Models. *Machine Vision and Applications*, 14(4):218–228, 2003.
4. E. Ozyildiz, N. Krahnstoever, and R. Sharma. Adaptive Texture and Color Segmentation for Tracking Moving Objects. *Pattern Recognition*, 35(10):2013–2029, 2002.
5. C. Lorenz and N. Krahnstoever. Generation of Point-Based 3D Statistical Shape Models for Anatomical Objects. *Computer Vision and Image Understanding*, 77:175–181, 2000.
6. A. Piel, F. Greiner, T. Klinger, N. Krahnstoever, and T. Mausbach. Chaos and Chaos Control in Plasmas. *Physica Scripta*, T84:128–131, 2000.
7. N. Krahnstoever, T. Klinger, F. Greiner, and A. Piel. Controlling Chaos in the Pierce Diode. *Phys. Lett. A*, 239(1,2):103–109, 1998.

Conference Papers / Other

1. Karthik Sankaranarayanan, Ming-Ching Chang, Nils Krahnstoever, “Tracking Gaze Direction from Far-Field Surveillance Cameras”, Workshop on Applications of Computer Vision (WACV), Kona, Hawaii, 2011.
2. Ming-Ching Chang, Nils Krahnstoever, Sernam Lim, Ting Yu, “Group Level Activity Recognition in Crowded Environments cross Multiple Cameras”, 2nd Workshop on Activity Monitoring by Multi-Camera Surveillance Systems (AMMCSS), Boston, MA, 2010.
3. Nils Krahnstoever, Ting Yu, Kedar A. Patwardhan and Dashan Gao, “Multi-Camera Person Tracking in Crowded Environments”, Workshop on Performance Evaluation for Tracking and Surveillance (Winter PETS), Snowbird, UT, 2009.
4. Nils Krahnstoever, Peter H. Tu, Ting Yu, Kedar A. Patwardhan, D. Hamilton, B. Yu, C. Greco, Gianfranco Doretto: Intelligent Video for Protecting Crowded Sports Venues. *AVSS 2009*: 116-121.
5. Ting Yu, Ser Nam Lim, Kedar Patwardhan and Nils Krahnstoever. Monitoring, recognizing and discovering social networks. In *Proc. IEEE Conference on Computer Vision and Pattern Recognition*, 2009.
6. N. Krahnstoever, Ting Yu, Ser-Nam Lim, Kedar Patwardhan. Collaborative Control of Active Cameras in Large-Scale Surveillance, In *Multi-Camera Networks Principles and Applications*, Hamid Aghajan, Andrea Cavallaro Ed., Elsevier, 2009.
7. Seon Joo Kim, Gianfranco Doretto, Jens Rittscher, Peter H. Tu, Nils Krahnstoever, Marc Pollefeys: A model change detection approach to dynamic scene modeling. *AVSS 2009*: 490-495.
8. Nils Krahnstoever: Commentary on “Visual Players Detection and Tracking in Soccer Matches”, *AVSS 2008*: 334-335.
9. A. Hoogs, S. Bush, G. Brooksby, A.G. Amitha Perera, M. Dausch, and N. Krahnstoever. Detecting Semantic Group Activities Using Relational Clustering. In *Proc. IEEE Workshop on Motion and Video Computing (WMVC)*, 2008.
10. N. Krahnstoever, Ting Yu, Ser-Nam Lim, Kedar Patwardhan, and Peter Tu. Collaborative Real-Time Control of Active Cameras in Large Scale Surveillance Systems. In *Proc. Workshop on Multi-camera and Multi-modal Sensor Fusion Algorithms and Applications (M2SFA2)*, October 2008.
11. P. Tu, T. Sebastian, G. Doretto, N. Krahnstoever, J. Rittscher, and T. Yu. Unified crowd segmentation. In *Proceedings of European Conference on Computer Vision*, 2008.
12. T. Yu, Y. Wu, N. Krahnstoever, and P. Tu. Distributed Data Association and Filtering for Multiple Target Tracking. In *Proc. IEEE Conference on Computer Vision and Pattern Recognition*, Anchorage, Alaska, June 2008.
13. X. Liu, N. Krahnstoever, Ting Yu, and Peter Tu. What are customers looking at? In *Proc. IEEE International Conference On Advanced Video and Signal Based Surveillance*, 2007.
14. P. Tu, G. Doretto, N. Krahnstoever, A. A. G. Perera, F. W. Wheeler, X. Liu, J. Rittscher, T. B. Sebastian, T. Yu, and K. G. Harding. An intelligent video framework for homeland protection. *Proceedings of SPIE*

Defence and Security Symposium - Unattended Ground, Sea, and Air Sensor Technologies and Applications IX, April 9--13, 2007. (Invited paper)

15. P. Tu, X. Liu, N. Krahnstoever, R. Book, P. Williams, and C. Adrian. Automatic Face Recognition from Skeletal Remains. In *In Proc. IEEE Conference on Computer Vision and Pattern Recognition*, 2007.
16. P. Tu, F. Wheeler, N. Krahnstoever, T. Sebastian, J. Rittscher, X. Liu, A. Perera, and G. Doretto. Surveillance video analytics for large camera networks. In *SPIE Newsroom*, 2007.
17. N. Krahnstoever and P. Mendonça. Autocalibration from tracks of walking people.. Technical Report General Electric Global Research, 2006.
18. N. Krahnstoever and P. Mendonça. Autocalibration from tracks of walking people.. In *Proc. British Machine Vision Conference (BMVC)*, Edinburgh, UK, 4-7 September, 2006.
19. N. Krahnstoever, R. Sebastian, G. Doretto, P. Tu, and M. Mahony. Intelligent video based detection and tracking of suicide bombers at standoff distances. In *TSWG Explosives Detection Conference*, Miami, FL, USA, June 12--16, 2006.
20. N. Krahnstoever, P. Tu, T. Sebastian, A. Perera, and R. Collins. Multi-View Detection and Tracking of Travelers and Luggage in Mass Transit Environments. In *Proc. Ninth IEEE International Workshop on Performance Evaluation of Tracking and Surveillance (PETS)*, 2006.
21. N. Krahnstoever, T. Kelliher, and J. Rittscher. Obtaining Pareto Optimal Performance of Visual Surveillance Algorithms. In *Proc. of IEEE International Workshop on Performance Evaluation of Tracking and Surveillance (PETS)*, Breckenridge, CO, January 2005. (688.2kB)
22. N. Krahnstoever and P. Mendonça. Bayesian Autocalibration for Surveillance. Technical Information Series Nr. 2005GRC202, GE Global Research, 2005.
23. N. Krahnstoever and P. Mendonça. Bayesian Autocalibration for Surveillance. In *Proc. of IEEE International Conference on Computer Vision (ICCV'05)*, Beijing, China, October 2005.
24. N. Krahnstoever, J. Rittscher, P. Tu, K. Chean, and T. Tomlinson. Activity Recognition using Visual Tracking and RFID. In *Proc. of IEEE Workshop on Application of Computer Vision*, pp. 494–500, 1, January 2005.
25. X. Liu, P. H. Tu, J. Rittscher, A. G. A. Perera, and N. Krahnstoever. Detection and Counting People in Surveillance Applications. In *Proceeding of IEEE International Conference on Advanced Video and Signal-Based Surveillance*, Teatro Sociale, Como, Italy, September 2005.
26. J. Rittscher, N. Krahnstoever, and L. Galup. Multi-Target Tracking Using Hybrid Particle Filtering. In *Proc. IEEE Workshop on Applications of Computer Vision (WACV)*, Breckenridge Colorado, 2005.
27. J. Rittscher, P. Tu, and N. Krahnstoever. Simultaneous Estimation of Segmentation and Shape. In *Proceedings of the 2005 IEEE Conference on Computer Vision and Pattern Recognition*, 2005.
28. N. Krahnstoever and R. Sharma. Articulated Models from Video. In *Proceedings of the IEEE Computer Society Conference on Computer Vision and Pattern Recognition*, pp. 894–901, 1, Washington, DC, June-July 2004.
29. N. Krahnstoever. Articulated Models from Video. Ph.D. Thesis, Pennsylvania State University, 2003.
30. N. Krahnstoever and R. Sharma. Appearance Management and Cue Fusion for 3D Model-Based Tracking. In *Proc. of IEEE Conference on Computer Vision and Pattern Recognition*, pp. 249–254, 2, Madison, Wisconsin, USA, June 2003. There is a related tech-report that contains more details.
31. N. Krahnstoever and R. Sharma. Appearance Management and Cue Fusion for 3D Model-Based Tracking. Technical Report CSE-03-009, Department of Computer Science and Engineering, The Pennsylvania State University, 2003.
32. S. Kettebekov, M. Yeasin, N. Krahnstoever, and R. Sharma. Prosody based Co-Analysis of Deictic Gestures and Speech in Weather Narration Broadcast. In *Workshop on Multimodal Resources and Multimodal Systems Evaluation*, 3rd Int. Conf. on Language Resources and Evaluation (LREC), Palacio de Congreso de Canarias Las Palmas, Spain, June 2002.
33. N. Krahnstoever, S. Kettebekov, M. Yeasin, and R. Sharma. A Real-Time Framework for Natural Multimodal Interaction with Large Screen Displays. In *Fourth International Conference on Multimodal Interfaces (ICMI'2002)*, Pittsburgh, PA USA, 2002. Endnote
34. N. Krahnstoever, E. Schapira, S. Kettebekov, and R. Sharma. Multimodal Human-Computer Interaction for Crisis Management Systems. In *Proc. of IEEE Workshop on Applications of Computer Vision (WACV 2002)*, The Orlando World Center Marriott, FL, USA, December 2002.
35. N. Krahnstoever and R. Sharma. Robust Probabilistic Estimation of Uncertain Appearance for Model Based Tracking. In *Proc. of IEEE Workshop on Motion and Video Computing (MOTION 2002)*, The Orlando World Center Marriott, FL, USA, December 2002.
36. N. Krahnstoever, M. Yeasin, and R. Sharma. Automatic acquisition and initialization of articulated models. In *Proc. IEEE Conference on Computer Vision and Pattern Recognition (CVPR 2001)*, Technical Sketches,

Kauai Marriott, Hawaii, USA, 2001.

37. N. Krahnstoeve, M. Yeasin, and R. Sharma. Towards a unified framework for tracking and analysis of human motion. In Proc. IEEE Workshop on Detection and Recognition of Events in Video, pp. 47–54, July 2001.
38. S. Kettebekov, N. Krahnstoeve, M. Leas, E. Polat, H. Raju, E. Schapira, and R. Sharma. i2Map: Crisis Management using a Multimodal Interface. In Proceedings of the ARL Federated Laboratory 4th Annual Symposium, March 2000.
39. E. Ozyildiz, N. Krahnstoeve, and R. Sharma. Fusion of Texture and Color for Robust Visual Tracking. In ARL Federate Laboratory 4th Annual Symposium, College Park, MD, March 2000.
40. N. Krahnstoeve and C. Lorenz. Development of a point based shape representation of arbitrary three-dimensional medical objects suitable for statistical shape modeling. In In Proc. Medical Imaging: Image Processing Conf., San Diego, SPIE Proceedings Series, February 1999.
41. C. Lorenz and N. Krahnstoeve. 3D statistical shape models for medical image segmentation. In Proceedings of the Second International Conference on 3-D Digital Imaging and Modeling (3DIM), Ottawa, Canada, pp. 414–423, October 4-8 1999.
42. F. Greiner, T. Klinger, H. Kolinsky, N. Krahnstoeve, T. Mausbach, and A. Piel. The Pierce-Diode as a Model for Selfoscillations and Controlling Chaos in Thermionic Discharges. In Proc. International Congress on Plasma Physics and 25th EPS Conference on Controlled Fusion and Plasma Physics, Praha, pp. 2240, June 29 - July 3 1998.
43. N. Krahnstoeve. Chaoskontrolle in der Pierce-Diode. Master's Thesis, Institut für Experimentelle und Angewandte Physik, Christian-Albrechts-Universität Kiel, Germany, 1998.
44. N. Krahnstoeve, T. Klinger and F. Greiner, and A. Piel. Systematische Chaoskontrolle in der Pierce-Diode. In DPG Tagung Bayreuth, pp. 326, 1998.

Patents

(updated February 2011)

1. Standoff detection systems and methods, 7885429, February 2011
2. System, method and program product for camera-based discovery of social networks, US20100245567, September 30, 2010.
3. Method and system for crowd segmentation, US20090310862, December 17, 2009.
4. Method and system for camera autocalibration, US7356425, April 2008.
5. Method and apparatus for robustly tracking objects, US7317812 B1, January 2008.
6. Method and system for detecting conscious hand movement patterns and computer-generated visual feedback for facilitating human-computer interaction, US7274803 B1, September 2007.
7. Method and apparatus for providing virtual touch interaction in the drive-thru, US6996460 B1, February 2006.
8. Method and system for automatic pose and trajectory tracking in video, Pending, US20090015678 A1, January 2009.
9. Method and system for remote estimation of motion parameters, Pending, US20080291272 A1, Nov 2008.
10. Method and system for distributed multiple target tracking, Pending, US20080259163 A1, October 2008.
11. Adaptive advertising and marketing system and method, Pending, US20080243614 A1, October 2008.
12. Standoff detection systems and methods, Pending, US20070286460 A1, December 2007.
13. Intelligent railyard monitoring system, Pending, US20070291985 A1, December 2007.
14. Method and system for performing image re-identification, Pending, 7711146, May 4, 2010.
15. System and method for automatic person counting and detection of specific events, 7596241, September 29, 2009.
16. Method and system for camera autocalibration, Pending, US20060215031 A1, September 2006.
17. System and method for passive face recognition, Pending, US20060120571 A1, June 2006.
18. System and method for tracking articulated body motion, Pending, US20060045310 A1, March 2006.