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RESEARCH EXPERTIES

Image processing, Biomedical image analysis, Deformable models, Deformable image registration, Level set methods, Statistical shape modeling, Atlas-based segmentation, Human brain mapping

EDUCATION

- Ph.D.** October 2003, Electrical Engineering, The Johns Hopkins University
Dissertation title: *Anatomically Consistent Segmentation of Medical Imagery Using a Level Set Method and Digital Topology*
Research advisor: Professor Jerry L. Prince
- M.Sc.** May 2001, Electrical Engineering, The Johns Hopkins University
Course work emphasized image processing, medical imaging, and statistical signal processing
GPA: 4.0/4.0
- M.Eng.** June 1997, Electrical Engineering, National University of Singapore
Thesis title: *3D Visual Inspection of IC Bonding Wires*
Thesis advisors: Drs. Ong Sim Heng and Qinzhong Ye
GPA: 4.0/4.0
- B.Sc.** July 1994, Electrical Engineering, University of Science and Technology of China, China
GPA: 3.7/4.0

RESEARCH EXPERIENCE

- Research Scientist**, Computerized Medical Systems, March 2006 — present
Research and development of deformable registration and atlas-based segmentation methods for applications in radiation therapy planning
- Postdoctoral Fellow**, Center for Biomedical Imaging, Mass. General Hospital, September 2004 — February 2006
Brain morphometric analysis, whole brain parcellation, segmentation of multi-spectral MRI brain images, multi-modality image registration
- Postdoctoral Fellow**, The Johns Hopkins University, November 2003 — August 2004
Further development of brain cortical reconstruction methods to improve accuracy and efficiency; development of adaptive grid level set methods
- Research Assistant**, The Johns Hopkins University, February 1999 — October 2003
Performed research in image segmentation, brain cortical surface reconstruction, and topology correction
- Research Engineer**, National University of Singapore, July 1997 — June 1998
Designed and programmed a graphical user-interface and a software package for automatic landmark identification and analysis of digitized cephalograms
- Research Assistant**, National University of Singapore, July 1995 — June 1997
Designed a computer vision system for automatic IC bonding wire inspection

TEACHING EXPERIENCE

- Fall 2002: Teaching assistant for 520.651 Random Signal Analysis, The Johns Hopkins University
Spring 2002: Grader for 520.432 Medical Imaging Systems, The Johns Hopkins University
Fall 1998: Teaching assistant for ELEG 309 Electronic Circuit Analysis, University of Delaware
Summer 1998: TA training program, University of Delaware

PROFESSIONAL ACTIVITIES

Member of Sigma Xi

Reviewer for

IEEE Transactions on Pattern Analysis and Machine Intelligence

IEEE Transactions on Medical Imaging

IEEE Transactions on Image Processing

Journal of Medical Image Analysis

Image and Vision Computing Journal

The Visual Computer Journal

International Journal of Pattern Recognition and Artificial Intelligence

PUBLICATIONS

Journal Articles:

- J1. **X. Han**, C. Xu and J. L. Prince. A Moving Grid Framework for Geometric Deformable Models. Accepted to *Int. J. Computer Vision*, 2009.
- J2. Y. Bai, **X. Han** and J. L. Prince. Digital Topology on Adaptive Octree Grids. Accepted to *Journal of Mathematical Imaging and Vision*, 2009.
- J3. J. Jovicich, S. Czanner, **X. Han**, D. Salat, A. van der Kouwe, B. Quinn, J. Pacheco, M. Albert, R. Killiany, D. Blacker, P. Mahuire, D. Rosas, N. Makris, R. Gollub, A. Dale, B. Dickerson, and B. Fischl. MRI-derived Measurements of Human Subcortical, Ventricular and Intracranial Brain Volumes. *NeuroImage*, 46(1):177–92, 2009.
- J4. **X. Han** and B. Fischl. Atlas renormalization for improved brain MR image segmentation across scanner platforms. *IEEE Trans. Medical Imaging: special issue on computational neuroanatomy*, 26(4):479–486, 2007.
- J5. Y. Peng, P. E. Grant, Y. Qi, **X. Han**, F. Segonne, R. Pienaar, E. Busa, J. Pacheco, N. Makris, R. L. Buckner, P. Golland, and B. Fischl. Cortical surface shape analysis based on spherical wavelets. *IEEE Trans. Medical Imaging: special issue on computational neuroanatomy*, 26(4):582–597, 2007.
- J6. **X. Han**, C. Xu, and J. L. Prince. Fast numerical scheme for gradient vector flow computation using a multigrid method. Accepted to *IEE Proceedings on Vision, Image & Signal Processing*, 2007.
- J7. **X. Han**, J. Jovicich, B. Dickerson, B.T. Quinn, A. Dale, and B. Fischl. Reliability of MRI-derived measurements of human cerebral cortical thickness. *NeuroImage*, 32(1):180–194, 2006.
- J8. **X. Han**, D. L. Pham, D. Tosun, M. E. Rettmann, C. Xu, and J. L. Prince. CRUISE: Cortical reconstruction using implicit surface evolution. *NeuroImage*, 23(3):997–1012, 2004.
- J9. D. Tosun, M. E. Rettmann, **X. Han**, X. Tao, C. Xu, S. M. Resnick, D. L. Pham, and J. L. Prince. Cortical surface segmentation and mapping. *NeuroImage*, 23(1):S108–S118, 2004.
- J10. J. T. Ratnanather, L. Wang, M. B. Nebel, M. Hosakere, **X. Han**, J. G. Csernansky, and M. I. Miller. Validation of semi-automated methods for quantifying cingulate cortical metrics in Schizophrenia. *Psychiatry Research: NeuroImaging*, 132:53–68, 2004.
- J11. **X. Han**, C. Xu, and J. L. Prince. A topology preserving level set method for geometric deformable models. *IEEE Trans. on Patt. Anal. Machine Intell.*, 25(6):755–768, 2003.
- J12. M. E. Rettmann, **X. Han**, C. Xu, and J. L. Prince. Automated sulcal segmentation using watersheds on the cortical surface. *NeuroImage*, 15(2):329–344, 2002.
- J13. **X. Han**, C. Xu, U. Braga-Neto, and J. L. Prince. Topology correction in brain cortex segmentation using a multiscale, graph-based algorithm. *IEEE Trans. on Medical Imaging*, 21(2):109–121, 2002.
- J14. Q.Z. Ye, S.H. Ong, and **X. Han**. A stereo vision system for the inspection of IC bonding wires. *Int. J. Imaging Systems and Technology*, 11(4):254–262, 2000.

Book:

1. **X. Han**. Medical Image Segmentation Using Level Set Method and Digital Topology: Concepts and New Developments. VDM Verlag Dr. Müller, 2008.

Book Chapters:

- B1. C. Xu, **X. Han**, and J. L. Prince. Gradient Vector Flow Deformable Models. In *Handbook of Medical Image Processing and Analysis*, edited by I. Bankman, 2nd Edition. Academic Press, Dec. 2008.

- B2. **X. Han**, C. Xu, and J. L. Prince. Topology preserving geometric deformable model for brain reconstruction. In *Geometric Level Set Methods in Imaging, Vision and Graphics*, edited by S. Osher and N. Paragios. Springer Verlag, 2003.

Conference Articles:

- C1. **X. Han**, M. Hoogeman, P. C. Levendag, L. Hibbard, D. N. Teguh, P. Voet, A. C. Cowen, and T. K. Wolf. Atlas-based Auto-segmentation of Head and Neck CT Images. In *11th Intl. Conf. Medical Image Computing and Computer Assisted Intervention (MICCAI 2008)*, Sept. 6-10, 2008.
- C2. Y. Bai, **X. Han**, and J.L. Prince. Octree grid topology-preserving geometric deformable model for three-dimensional medical image segmentation. In *Information Processing in Medical Imaging 2007 (IPMI 2007)*, The Netherlands, July 2007. (**Acceptance rate:** < 33%)
- C3. Y. Bai, **X. Han**, and J.L. Prince. Topology-preserving geometric deformable model on adaptive quadtree grid. In *IEEE Conf. on Comp. Vis. Patt. Recog.* (CVPR 2007), Minneapolis, June 2007. (**Acceptance rate:** < 30%)
- C4. **X. Han**, L. Hibbard, and S. Brame. A morphing active surface model for automated recontouring in 4D radiotherapy. In *SPIE Conf. Medical Imaging*, San Diego, 2007.
- C5. P. Yu, **X. Han**, F. Segonne, R. Buckner, R. Pienaar, E. Grant, P. Golland, and B. Fischl. Cortical surface shape analysis based on spherical wavelet transformation. In *IEEE Workshop on Math. Methods Biomed. Image Anal. (MMBIA)*, New York, 2006.
- C6. Y. Bai, **X. Han**, and J.L. Prince. Topology-preserving isosurface simplification. In *IEEE Workshop on Math. Methods Biomed. Image Anal. (MMBIA)*, New York, 2006.
- C7. P. Yu, **X. Han**, F. Segonne, A. Liu, R. Poldrack, P. Golland, and B. Fischl. Shape-based discrimination and classification of cortical surfaces. In *18th Int. Conf. Pattern Recognition (ICPR 2006)*, Hong Kong, 2006.
- C8. Y. Bai, **X. Han**, D. L. Pham, and J.L. Prince. Super-resolved multi-channel fuzzy segmentation of MR brain images. In *SPIE Conf. Medical Imaging*, 2005.
- C9. Y. Bai, **X. Han**, and J. L. Prince. Super-resolution reconstruction of MR brain images. In *Proc. 38th Annual Conf. Info. Sci. Syst. (CISS'04)*, pages I:1358–1363, 2004.
- C10. **X. Han**, C. Xu, and J. L. Prince. A 2D moving grid geometric deformable model. In *Proc. IEEE Conf. on Comp. Vis. Patt. Recog. (CVPR)*, pages I:153–160, 2003.
- C11. D. L. Pham, **X. Han**, M. E. Rettmann, C. Xu, D. Tosun, S. Resnick, and J. L. Prince. New approaches for measuring changes in the cortical surface using an automatic reconstruction algorithm. In *Proc. SPIE Conf. Medical Imaging*, vol. 4684, pages 191–200, 2002.
- C12. **X. Han**, C. Xu, and J. L. Prince. A topology preserving deformable model using level sets. In *Proc. IEEE Conf. on Comp. Vis. Patt. Recog. (CVPR)*, pages II:765–770, 2001.
- C13. **X. Han**, C. Xu, D. Tosun, and J. L. Prince. Cortical surface reconstruction using a topology preserving geometric deformable model. In *Proc. 5th IEEE Workshop on Math. Methods Biomed. Image Anal. (MMBIA)*, pages 213–220, 2001.
- C14. X. Tao, **X. Han**, M. E. Rettmann, J. L. Prince, and C. Davatzikos. Statistical study on cortical sulci of human brains. In *Proc. XVIIth Int. Conf. Info. Process. Medical Imag. (IPMI)*, pages 428–442, 2001.
- C15. **X. Han**, C. Xu, and J. L. Prince. Topology correction for brain cortex segmentation. In *Proc. XVIIth Int. Conf. Info. Process. Medical Imag. (IPMI)*, pages 395–401, 2001.
- C16. **X. Han**, C. Xu, M. E. Rettmann, and J. L. Prince. Automated segmentation editing for cortical surface reconstruction. In *Proc. SPIE Conf. Medical Imaging*, vol. 4322, pages 194–203, 2001.
- C17. M. E. Rettmann, **X. Han**, and J. L. Prince. Watersheds on the cortical surface for automated sulcal segmentation. In *Proc. 4th IEEE Workshop on Math. Methods Biomed. Image Anal. (MMBIA)*, pages 20–27, 2000.
- C18. **X. Han**, M. E. Rettmann, C. Xu, and J. L. Prince. Morphology on triangle meshes using geodesic distance. In *Proc. 34th Annual Conf. Info. Sci. Syst. (CISS'00)*, pages TP5:23–24, 2000.
- C19. S. H. Ong, **X. Han**, S. Ranganath, A. A. Kassim, K. F. Lim, and K. W. C. Foong. Identification of feature points in cephalograms. In *Proc. 5th Int. Conf. Control, Automation, Robotics and Vision*, pages 599–602, 1998.
- C20. S. H. Ong, **X. Han**, and Q. Ye. 3D visual inspection of IC bonding wires. In *Proc. SPIE: Automatic Inspection and Novel Instrumentation*, vol. 3185, pages 68–77, 1997.

Published Abstracts:

- A1. P. C. Levendag, M. Hoogeman, D. Teguh, T. Wolf, L. Hibbard, O. Wijers, B. Heijmen, P. Nowak, E. Vasquez-Osorio, and **X. Han**, Atlas Based Auto-segmentation of CT Images: Clinical Evaluation of using Auto-contouring in High-dose, High-precision Radiotherapy of Cancer in the Head and Neck. Abstract #2518, ASTRO 2008, Boston, 2008.
- A2. M. Hoogeman, **X. Han**, D. Teguh, T. Wolf, L. Hibbard, O. Wijers, B. Heijmen, P. Nowak, E. Vasquez-Osorio, and P. Levendag, Atlas Based Auto-segmentation of CT Images in Head and Neck Cancer: What is the Best Approach? Abstract #2941, ASTRO 2008, Boston, 2008.
- A3. **X. Han**, and B. Fischl, Intensity renormalization for improved brain MR image segmentation across scanner platforms. Abstract 451, NeuroImage Human Brain Mapping 2006 Meeting, Florence, Italy, 2006.
- A4. P. L. Bazin, **X. Han**, D. Tosun, J. L. Prince and D. L. Pham, Cortical reconstruction using topology preserving tissue classification. Abstract 73, NeuroImage Human Brain Mapping 2006 Meeting, Florence, Italy, 2006.
- A5. S. Czanner, **X. Han**, J. Pacheco, and *et al.*, Test-retest reliability assessment for longitudinal MRI studies. Abstract 64, NeuroImage Human Brain Mapping 2006 Meeting, Florence, Italy, 2006.
- A6. **X. Han**, and B. Fischl, Intensity renormalization for improved brain MR image segmentation across scanner platforms. Abstract 451, NeuroImage Human Brain Mapping 2006 Meeting, Florence, Italy, 2006.
- A7. J. Jovicich, S. Czanner, **X. Han**, and *et al.*, Reproducibility of automated brain morphometric estimates derived from multi-site structural MRI studies. International Society for Magnetic Resonance in Medicine 2006: 14th Scientific Meeting and Exhibition, Seattle, 2006.
- A8. **X. Han**, J. Jovicich, D. Salat, and *et al.*, CNR comparison of three pulse sequences for structural MR brain imaging. Abstract 847, NeuroImage Human Brain Mapping 2005 Meeting, Toronto, CA, 2005.
- A9. B.T. Quinn, E. Fenstermacher, **X. Han**, and *et al.*, Test-retest reliability assessment for longitudinal MRI studies: A comparison of the effects of different T_1 -weighted protocols, scanner platforms, and field strengths on semi-automated hippocampal volume measures. Abstract 847, NeuroImage Human Brain Mapping 2005 Meeting, Toronto, CA, 2005.
- A10. P. Yu, F. Segonne, **X. Han**, and B. Fischl. Shape analysis of neuroanatomical structures based on spherical wavelets. NeuroImage Human Brain Mapping 2005 Meeting, Toronto, CA, 2005.
- A11. M. E. Rettmann, **X. Han**, and J. L. Prince. Automated parcellation of the cortical surface for computation of regional gyrification indices. Abstract 230, NeuroImage Human Brain Mapping 2001 Meeting, Brighton UK, 2001.
- A12. D. Tosun, M. E. Rettmann, X. Tao, **X. Han**, C. Xu, J. L. Prince. Calculation of human cerebral cortical thickness on opposing sulcal banks. Abstract 268, NeuroImage Human Brain Mapping 2001 Meeting, Brighton UK, 2001.
- A13. M. E. Rettmann, **X. Han**, D. L. Pham and J. L. Prince. Geodesics for sulcal segmentation and depth measurements. Abstract 667, NeuroImage Human Brain Mapping 2000 Meeting, San Antonio USA, 2000.
- A14. C. Xu, **X. Han**, and J. L. Prince. Improving cortical surface reconstruction accuracy using an anatomically consistent gray matter representation. Abstract 581, NeuroImage Human Brain Mapping 2000 Meeting, San Antonio USA, 2000.

Invited Talk

1. Cortical surface reconstruction using a topology preserving geometric deformable model. Invited Talk, CISST/ERC Seminar, the Johns Hopkins University, February 2002.
2. Geometric deformable models for brain cortical surface reconstruction. Medical Vision Group Seminar, the Massachusetts Institute of Technology, October 2004.
3. Atlas-driven segmentation of multi-spectral MR brain images. Department of Electrical and Computer Engineering, the University of Iowa, October 2005.