

Curriculum Vitae

ANDREW R. WILLIS, PH.D.

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EDUCATION

Brown University / Providence, RI USA

- Ph.D., *Scientia Machina* (Electrical Engineering), Thesis: *Stochastic 3D Geometric Models for Classification, Deformation, and Estimation*. May 2004.
- Master of Applied Math, Thesis Topic: *Markov Random Field Modeling for 3D Shape Sculpting*, May 2003.
- Master of Electrical Sciences, Thesis Topic: *Bayesian 3D Pot-Assembly from Fragments as Problems in Perceptual-Grouping and Geometric-Learning*, May 2001.

Worcester Polytechnic Institute / Worcester, MA USA

- Bachelor of Electrical Engineering *cum laude*, Undergraduate Thesis Topic: *Design and Implementation of a DSP replica of Jimi Hendrix's UniVibe Guitar Effects Pedal*, May 1995.
- Bachelor of Computer Science *cum laude*, Undergraduate Thesis Topic: *A L^AT_EX-driven WYSIWYG Computer Music Notation Typesetting Program*, May 1994.

PROFESSIONAL APPOINTMENTS

Assistant Professor / University of North Carolina - Charlotte / August 2005 - present

- Developed courses : Computer Vision, Pattern Recognition, Design of Intelligent Spacecraft, Advanced Computer Graphics and Digital Signal Processing.
- Procured \$449,439 in research and educational grant funding through funding agencies including NASA, NSF, and NIH.

Postdoctoral Research Associate and SHAPE Lab Manager / Brown University / June 2004 - August 2005

- Manager and principal researcher for the SHAPE Lab which entails the supervision of graduate and undergraduate students, system and device procurement, administration, and maintenance.

Researcher / Brown University / 2002 - May 2004

- Assisted in the writing of two successful NSF grants : NSF-ITR Grant #IIS-0205477 (\$1.3M distributed over years 1999-2001) and NSF-KDI Grant #BCS-9980091 (\$2M distributed over years 2002-2005).
- Technical director of NSF-sponsored data collection expedition to the archaeological excavation of the Great Temple in Petra, Jordan during the Summer of 2002.
- Invented and implemented the first system which automatic assembles axially symmetric 3D objects from their fragments emphasizing the important application of assembling archaeological vessels from vessel fragments.

Research Consultant / Analog Devices / Norwood, MA / 1999-2002

- Software / hardware design of the ADVJP2000 image compression integrated circuit (released May 2002). The current revision (Aug. 2004) of this IC is referred to as Analog Devices ADV202 JPEG2000 Video codec.

Process Control Design & Field Service Engineer / Morgan Construction Co. / Worcester, MA 01615 / 1995-1998

- Designed / installed and upgraded control systems for high speed (>100 m/sec) steel rod manufacturing and managed on-site installation teams for contracts in excess of \$2M.

TEACHING

Courses Taught - University of North Carolina at Charlotte

- ECGR4124/5124/8113 Digital Signal Processing (Undergraduate/Graduate credit)
 - Fall 2005
 - Fall 2006
 - Fall 2007
- ECGR4103/5103 Applied Computer Graphics (Undergraduate/Graduate credit)
 - Spring 2005
 - Spring 2008
- ECGR6090/8090 Computer Vision and Pattern Recognition Seminar Course (Graduate credit)
 - Fall 2006
- ECGR3090/6090/8090 Design of Intelligent Spacecraft (Undergraduate/Graduate credit)
 - Spring 2007
- ECGR4090/6090/8090 Computer Vision (Undergraduate/Graduate credit)
 - Fall 2007
- ECGR4090/6090/8090 Pattern Recognition (Undergraduate/Graduate credit)
 - Spring 2008

STUDENT ADVISING

Advised Ph.D. Degrees

- Sui, Y., *Tentative title : Markov Field Analysis for 3D Object Recognition, to be completed May 2011.*
- Liu, P., *Tentative title : Image Processing and Computer Vision Techniques towards Automatic Insect Recognition, to be completed May 2011.*
- Zhou, B., *Tentative title : A Cybernetic System for Complex Bone Fracture Reassembly, to be completed May 2012.*

Advised M.Sc. Degrees

- Mogallapu, V., *Semi-Automatic 3D Reconstruction of Highly Fragmented Bone Fractures*, Masters Thesis, University of North Carolina at Charlotte, August 2007.
- Mack, C., *A Simple, Cost Effective, Active Range Sensing System*, Masters Thesis, University of North Carolina at Charlotte, June 2007.

Advised Undergraduate Student Projects

- Chan, Sye-Min, *Semi-Automatic Assembly of Broken Fragments*, Undergraduate Honors Thesis, Brown University, May 2005.
- Brewer, D. and Sheldon, C., *High Speed Frequency Detection in FPGAs*, Undergraduate Senior Design Project, University of North Carolina at Charlotte, December 2005.
- Conrad, N., *Linux Device Driver for the Acuity AR-4000*, Undergraduate Senior Design Project, University of North Carolina at Charlotte, December 2006.
- Vasconez, P. and Daniels, M. and Adams, Q. and Fennel, A., *FPGA/DSP Performance Comparison Project*, Undergraduate Senior Design Project, University of North Carolina at Charlotte, May 2007.
- Meiswinkel, T. and Abdulrazzak, A. and Haines, J. and Stevens, A., *NC Spacegrant Rover Vision System Design*, Undergraduate Senior Design Project, University of North Carolina at Charlotte, *to be completed December 2007*.

Graduate Student Independent Study Projects

- Davuluri, S., *Intensity smoothing and Equalization of Mars Rover Images using MRF models*, Individual Study Project, University of North Carolina at Charlotte, May 2006.
- Mogallapu, V., *Bone Segmentation in 3D CT Images*, Individual Study Project, University of North Carolina at Charlotte, December 2006.
- Mysore, G., *Design and Implementation of a low-cost 3D range scanning device*, Individual Study Project, University of North Carolina at Charlotte, May 2006.

Teaching Workshops / Seminars

- Workshop on Learning Styles and Active Learning, *How To Get Students Actively Involved in their Learning, even if you have 150 of them in the class*, presented by Dr. Richard M. Felder, North Carolina State University, June 6, 2006.

UNIVERSITY AND COMMUNITY SERVICE

Electrical and Computer Engineering Department

- Computer Committee Departmental Representative (8/2005 - 12/2006)
- Computer Engineering FAIT Committee (8/2005 - present)
- Communications and Signal Processing FAIT Committee (8/2005 - present), chair (10/2006 - present).
- Undergraduate Curriculum Committee (10/2006 - present).
- Publicity Committee (8/2006 - present)
- Advisor, Student Branch, [Eta Kappa Nu, An Electrical and Computer Engineering Honor Society](#) (HKN) (8/2007 - present).

William States Lee College of Engineering

- College of Engineering Computer Committee (8/2005 - 12/2006)
- Faculty Competitive Grants Committee (8/2006 - 8/2007).

University of North Carolina at Charlotte

- Reviewer, UNCC Distinguished Ph.D. Dissertation Awards, 2006.
- Reviewer, UNCC Distinguished Masters Thesis Awards, 2006.

SCHOLARLY SERVICE

Conference Committee Membership

- Program Committee Member for ICCV2007. [The Eleventh IEEE International Conference on Computer Vision](#) Rio de Janeiro, Brazil, October 14-21, 2007.
- Program Committee Member for 3DIM2007, [The 6th International Conference on 3-D Imaging and Modeling](#), Montréal, Canada, August 21-23, 2007.
- Program Committee Member for CVPR2008, [IEEE Computer Society Conference on Computer Vision and Pattern Recognition](#), Anchorage, Alaska, USA, June 24-26, 2008.

Journal Article Reviewer

- IEEE Transactions on Pattern Analysis and Machine Intelligence (2001).
- Elsevier Science Journal of Image and Vision Computing (2005, 2008).
- IEEE Transactions on Image Processing (2005).
- Journal of Circuits, Systems and Computers (2007).

Conference Article Reviewer

- ICCV2007, [The Eleventh IEEE International Conference on Computer Vision](#), Rio de Janeiro, Brazil, October 14-21, 2007.
- IEEE SoutheastCon 2007, [Technical Conference for the IEEE SouthEast Region](#), Richmond, VA, USA, March 22-25, 2007.
- 3DIM 2007, [The 6th International Conference on 3-D Imaging and Modeling](#), Montréal, Canada, August 21-23, 2007.
- ASEE 2008, [115th Annual American Society for Engineering Education Conference & Exposition](#), Pittsburgh, PA, USA, June 22-25, 2007.
- CVPR2008, [IEEE Computer Society Conference on Computer Vision and Pattern Recognition](#), Anchorage, Alaska, USA, June 24-26, 2008.

Grant Proposal Reviewer

- NSF Intelligent Information Systems (IIS) Computer and Information Science and Engineering (CISE) Computing Resource Infrastructure (CRI) (January 2007).
- NASA: North Carolina Spacegrant Consortium proposals to the New Investigations Program (NIP) (March 2008).

PUBLICATIONS AND RESEARCH

Dissertation

Willis, A., *Stochastic 3D Geometric Models for Classification, Deformation, and Estimation*, Ph.D. Thesis, Brown University, May 2004. (7 citations^{†1})

^{†1} citation source data from [Google Scholar](http://scholar.google.com) : <http://scholar.google.com> on August 15, 2007

Refereed Journal Articles

1. **Willis, A.** and Speicher, J. and Cooper, D.B., *Rapid Prototyping 3D Objects from Scanned Measurement Data*, Journal of Image and Vision Computing, 25(7), pp. 1174-1184, 2007. (citations not available)
2. **Willis, A.** and Cooper, D.B., *From Ruins to Relics : Computational Reconstruction of Ancient Artifacts*, IEEE Signal Processing Magazine, *accepted for publication 2008*.

Refereed Conference Articles

1. Sui, Y. and **Willis, A.**, Using Markov Random Fields and Algebraic Geometry to Extract 3D Symmetry Properties, Fourth International Symposium on 3D Data Processing, Visualization and Transmission (3DPVT), June 18-20, Atlanta, GA, *to appear 2008*.
2. **Willis, A.** and Conrad, J., *Design of Intelligent Spacecraft : An Interdisciplinary Engineering Education Course*, ASEE Annual Conference & Exposition June 22-25, Pittsburgh, PA, *to appear 2008*.
3. **Willis, A.** and Conrad, J., *Senior Design Project: A Robotic System using Stereoscopic Cameras for Navigation*, ASEE Annual Conference & Exposition June 22-25, Pittsburgh, PA, *to appear 2008*.
4. **Willis, A.** and Anderson, D. and Thomas, T. and Brown, T. and Marsh, J.L., *3D Reconstruction of Highly Fragmented Bone Fractures*, Proceedings of SPIE Volume 6512, pp. 65121P1–65121P10, SPIE Conference on Medical Imaging, February 17–22, San Diego, California, 2007. (citations not available)
5. Anderson, D. and Thomas, T. and **Willis, A.** and Brown, T. and Marsh, J.L., *Identifying Fragment Morphology for 3-D Puzzle Solving / Surgical Planning*, 53rd Annual Meeting of the Orthopaedic Research Society, February 11-14, San Diego, California. Abstract 4161A26492, 2007. (citations not available)
6. Mack, C. and Mogallapu, V. and **Willis, A.** and Weldon, T., *Exploiting Typical Clinical Imaging Constraints for 3D Outer Bone Surface Segmentation*, IEEE Southeastcon 2007, Richmond, VA, March, 2007. (citations not available)
7. **Willis, A.** and Cooper D.B., *Estimating a-Priori Unknown 3D Axially Symmetric Surfaces from Noisy Measurements of their Fragments*, Third International Symposium on 3D Data Processing, Visualization and Transmission (3DPVT), pp. 334-341, 2006. (citations not available)
8. **Willis, A.** and Aspelund, K. *et. al.*, *Computational Schemes for Biomimetic Sculpture*, 5th International Conference on Creativity and Cognition (C&C), ACM SIGCHI Conference, pp. 22-31, London, April 12–14, 2005. (citations not available)
9. **Willis, A.** and Speicher, J. and Cooper, D., *Surface Sculpting with Stochastic Deformable 3D Surfaces*, International Conference on Pattern Recognition (ICPR), Vol. II, pp. 249–252, 2004. (5 citations †)
10. **Willis, A.** and Cooper, D., *Alignment of Multiple Non-Overlapping Axially Symmetric 3D Datasets*, International Conference on Pattern Recognition (ICPR), Vol. IV, pp. 96–9, 2004. (5 citations †)
11. **Willis, A.** and Cooper, D., *Bayesian Assembly of 3D Axially Symmetric Shapes from Fragments*, Conference on Computer Vision and Pattern Recognition (CVPR), Vol. I, pp. 82–89, 2004. (5 citations †)
12. **Willis, A.** and Cooper, D. *et. al.*, *Accurately Estimating Sherd 3D Surface Geometry with Application to Pot Reconstruction*, Conference on Computer Vision and Pattern Recognition (CVPR) Workshop, 2003. (10 citations †)
13. **Willis, A.** and Cooper, D. *et. al.*, *Bayesian Pot-Assembly from Fragments as Problems in Perceptual-Grouping and Geometric-Learning*, International Conference on Pattern Recognition (ICPR), Vol. III, pp. 297–302, 2002. (8 citations †)
14. **Willis, A.** and Orriols, X., Leymarie, F., Mumford, D. *et. al.*, *Assembling Virtual Pots from 3D Measurements of their Fragments*, VAST International Symposium on Virtual Reality Archaeology and Cultural Heritage, pp. 241–253, 2001. (11 citations †)

Unrefereed Conference Articles

1. Aspelund, K. and Hatcher, D. and **Willis, A.** *et. al.*, *Exhibit : Computational Schemes for Biomimetic Sculpture*, 5th International Conference on Creativity and Cognition (C&C), ACM SIGCHI Conference, pp. 298–300, London, April 12–14, 2005.
2. **Willis, A.** and Orriols, X. *et. al.*, *Extracting Axially Symmetric 3D Geometry from Limited 3D Range Data*, Technical Report LEMS-192, Brown University, Providence, RI, 2001.

INVITED TALKS

1. *Computer Vision and Biological Taxonomy*, presented at University of North Carolina at Greensboro, Seminar on New Directions in Visualization: Perspectives from Biology and Computer Science, April 4, 2008.
2. *Semi-Automatic 3D Reconstruction of Objects from their Fragments* presented at Iowa Institute of Biomedical Imaging (IIBI), University of Iowa, Department of Electrical and Computer Engineering and Department of Orthopaedic Surgery, November 6, 2007.
3. *Knowledge Modeling, Computational 3D Puzzle Solving, and Automatic Assembly of Archaeological Pottery* presented at :
 - (a) Kyungpook National University, Korea UNCC exchange program, January 19, 2006.
 - (b) Eta Kappa Nu Honor Society Seminar Series, Charlotte, North Carolina, October 4, 2005.
4. *Manipulation and Learning of 3D Stochastic Shape Models with Application to Archaeology*, presented at Massachusetts Institute of Technology Computer Science and Artificial Intelligence Laboratory (MIT - CSAIL), December 8, 2004.
5. *Stochastic Models for Estimation, Classification, and Deformation*, presented at Goldsmiths University of London, July 6, 2004.
6. *Assembling Virtual Pots from 3D Measurements of their Fragments (Geometric Learning)*, presented at :
 - (a) The Italy-United States Workshop : The Reconstruction of Archaeological Landscapes through Digital Technologies, at Boston University, Boston, Massachusetts, November 3, 2001.
 - (b) The Computer Science and Engineering Divisions of Sabanci University, Istanbul, Turkey, November 25, 2001.
 - (c) The Computer Science and Engineering Divisions of Bogazici University, Istanbul, Turkey, November 26, 2001.

RESEARCH GRANTS (TOTAL \$449,439)**Principal Investigator, Research (Total \$437,939)**

1. Willis, A. (100%), NIH 1 P50 AR055533-01 CORT: New Approaches to Assess and Forestall Osteoarthritis in Injured Joints, NIH Clinical Research Center Grant (P50) subcontract, 9/1/07 – 8/31/12, \$178,290 (sub-only).
2. Willis, A. (100%), New Approaches to Assess and Forestall Osteoarthritis in Injured Joints, University of Iowa subcontract, 9/1/07 – 8/31/12, \$181,980 (sub-only).
3. Willis, Andrew (100%), *Rebuilding the Past : Virtual Reconstruction of Collapsed Ancient Structures*, UNC Faculty Research Grant, 1/1/2007 - 5/31/2008, \$6000.
4. Andrew Willis (100%), Power Efficient Implementation of a Hardware Accelerated Real-Time 3D Reconstruction System, NASA: North Carolina Space Grant New Investigations Program (NC Spacegrant NIP), 7/1/2007 - 6/30/2008, \$25,000.

5. Andrew Willis (100%), *3D Free Form Models for the Representation, Manipulation, and Recovery of Shape, with Applications to Archaeology and Virtual Sculpting*, NSF Information Technology Research (ITR) subcontract from Brown University #IIS-0205477, 1/1/2007 - 9/1/2008, \$46,729 (sub-only).

Principal Investigator, Education (Total \$11,500)

1. Andrew Willis (100%), *Senior Design Project : RealTime Stereoscopic 3D Reconstruction on Low-Power FPGA Systems*, NASA : NC Space Grant : Exploration Systems Mission Directorate (ESMD) Design Award, 1/1/2007 - 9/15/2007, \$1,500.
2. Andrew Willis (100%), *A Course Proposal : Design of Intelligent Spacecraft*, NASA : NC Space Grant : Higher Education Program (HEP), 7/1/2006 -6/30/2008, \$10,000.

STUDENT ADVISING OF RESEARCH

Masters Students

- Mogallapu, V., *Semi-Automatic 3D Reconstruction of Highly Fragmented Bone Fractures*, Masters Thesis, University of North Carolina at Charlotte, August 2007.
- Mack, C., *A Simple, Cost Effective, Active Range Sensing System*, Masters Thesis, University of North Carolina at Charlotte, June 2007.

Ph.D. Students

- Sui, Y., *Tentative title : Markov Field Analysis for 3D Object Recognition, estimated date of completion May 2011.*
- Liu, P., *Tentative title : Power Efficient Implementation of a Hardware Accelerated Real-Time 3D Reconstruction System, estimated date of completion May 2011.*
- Zhou, B., *Tentative title : A Cybernetic System for Complex Bone Fracture Reassembly, estimated date of completion May 2012.*

RECENT RESEARCH COLLABORATIONS

Brown University • *Division of Engineering* : David Cooper, Ben Kimia, Gabriel Taubin, *Department of Judaic Studies* : Katarina Galor, *Department of Archaeology and the Ancient World* : Martha Sharp Joukowsky. **Tel-Aviv University** • *Department of Archaeology* : Oren Tal, Israel Roll. **University of Iowa** • *Department of Orthopaedic Biomechanics* : Tom Brown, Donald Anderson, Thaddeus Thomas, *Carver School of Medicine* : J. Lawrence Marsh. **University of North Carolina at Charlotte** • *Department of Electrical and Computer Engineering* : Tom Weldon, James Conrad, Ivan Howitt, Arindam Mukherjee, Arun Ravindran, *Environmental Assistance Office* : Regina Guyer, *Department of Biology* : Edward Menhinick, *Department of Art* : Malena Bergmann, *Department of Architecture* : Chris Beorkrem, *Department of Civil Engineering* : Brian Anderson. **University of North Carolina Greensboro** • *Department of Biology* : Bruce Kirchoff. **Smithsonian Institution** • *Department of Entomology* : Robert Robbins, Allen Norrbom. **Yale Peabody Museum** • *Department of Entomology* : Leonard Munstermann.

PROFESSIONAL AFFILIATIONS

Professional Societies

- [Institute of Electrical and Electronics Engineers](#) (IEEE) (1995 - present), upgraded to Senior Member (2006)
- [Association for Computing Machinery](#) (ACM) (2004 - present)
- [American Association for the Advancement of Science](#) (AAAS) (2005 - 2007)

- [American Society for Engineering Education](#) (ASEE) (2005 - present)
- [The International Society for Optical Engineering](#) (SPIE) (2006 - 2007)

Honor Societies

- [Sigma Xi, The Scientific Research Society](#) (2003 - present)
- [Eta Kappa Nu, An Electrical and Computer Engineering Honor Society](#) (2006 - present)