

Curriculum Vita

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Education

- Ph.D. (Computer Science), Michigan State University, 1990.
- M.S. (Computer Science), Michigan State University, 1986.
- B.S. (Electrical Engineering, honors), Michigan State University, 1985.

Professional Experience

- 2001–present: University of Notre Dame.
 - Professor of Computer Science and Engineering, 2004–present.
 - Concurrent Professor of Electrical Engineering, 2004–present.
 - Associate Professor of Computer Science and Engineering, 2001–2004.
 - Concurrent Associate Professor of Electrical Engineering, 2003–2004.
- 2007-2008: National Institute of Standards and Technology. Research Associate (sabbatical leave for Fall 2007 semester).
- 1998–2001: The Ohio State University.
 - Associate Professor of Electrical Engineering, 1998–2001.
 - Associate Professor of Computer and Information Science (by courtesy), 2000–2001.
- 1991–1998: Washington State University.
 - Associate Director for Computer Science, 1997–1998.
 - Associate Professor of Electrical Engineering and Computer Science, 1996–1998.
 - Undergraduate Coordinator, 1994–1997.
 - Assistant Professor of Electrical Engineering and Computer Science, 1991–1996.
- 1990–1991: University of Notre Dame.
 - Visiting Assistant Professor of Computer Science & Engineering.
- 1983–1990: Michigan State University.
 - Department of Computer Science: Research Associate (postdoctoral), Research Assistant and Teaching Assistant, 1986–1990.

- Department of Electrical Engineering and Systems Science: Undergraduate and Graduate Research Assistant, 1983–1986.
- 1987: Northrop Research and Technology Center. Research Intern.

Awards and Honors

- Fellow, International Association for Pattern Recognition, elected 2006.
- Undergraduate Teaching Award, Dept. of Computer Science and Engineering, University of Notre Dame, 2006.
- Certificates of Appreciation, International Association for Pattern Recognition, 2004, 2008.
- Faculty Fellow, John A. Kaneb Center for Teaching and Learning, University of Notre Dame, 2004–2005.
- ‘Star’ research award, Battelle Memorial Institute, 2000.
- ‘Key Contributor’ award, Battelle Memorial Institute, 2000.
- Certificates of Achievement, IEEE Computer Society, 1999, 2000, 2001 (two awards).
- Outstanding teaching award (computer science), College of Engineering and Architecture, Washington State University: 1994, 1997, 1998.
- Outstanding graduate student, Department of Computer Science, Michigan State University, 1990.
- GTE Graduate Fellowships, Department of Computer Science, Michigan State University, 1987–1989.
- College of Engineering undergraduate scholarships, Michigan State University, 1983–1985.
- National Merit Scholarship, Michigan State University, 1981–1985.
- Honorary society memberships: Tau Beta Pi, Eta Kappa Nu, Phi Kappa Phi, Sigma Xi, Upsilon Pi Epsilon.

Funding

Research

- ‘Biometric Discrimination of Identical Twins using Facial Identification’, FBI, \$138,000, 2009-2011 (lead PI; co-PI with K. Bowyer). Funded as additional work in US Army contract immediately below.
- ‘MBGC Design, Data Collection, and Support’, US Army, \$704,000, 2008-2009 (co-PI with K. Bowyer).
- ‘3D Mapping Research’, NAVTEQ, \$50,000, 2008 (gift).
- ‘HECURA: Deconstructing Clusters for High End Biometric Applications’, NSF, \$199,208, 2007-2009 (co-PI with D. Thain).
- ‘Face Recognition from Video’, US Department of Justice, \$362,476, 2006-2009 (lead PI; co-PI with K. Bowyer and N. Chawla).
- ‘Toward multi-modal face + ear “drive-by ID,”’ UNISYS, \$90,000, 2007-2008 (co-PI with K. Bowyer).

- ‘Development of ear biometrics: 2D, 3D and morphable models’, UNISYS, \$100,000, 2005-2006. (co-PI with K. Bowyer).
- ‘Advanced open image and video pre-processing platform for face imagery,’ UNISYS, \$100,000, 2005-2006. (co-PI with K. Bowyer) .
- ‘Characterizing 3D face data, sensors, and collection procedures’, UNISYS, \$50,000, 2005-2006. (co-PI with K. Bowyer) .
- ‘Research in Iris and 3-D Based Human Identification’, NSF, \$1,796,408, 2003–2009, (co-PI with Kevin Bowyer) (funded as supplements to ‘Instrumentation for Multidimensional Imaging and Applications’; see below)
- ‘Hydra: A Robust and Self Managing Video Sensing System for Retrospective Surveillance’, NSF, \$222,950, 2005–2006 (co-PI with Surendar Chandra).
- ‘Center for Advanced Biometric Research and Evaluation’, US Department of Justice, \$250,000, 2005–2006 (co-PI with Kevin Bowyer and Dimitris Samaras (SUNY-Stony Brook)).
- ‘Facial Feature Extraction and Quality Assessment for 2D/3D Multimodal Face Images’, Sandia National Laboratories, \$35,000, 2004–2005 (PI).
- ‘Improving the Ease of Use of Iris Recognition Systems: Advanced Open Iris Biometrics’, National Geospatial Intelligence Agency, \$240,000 (lead PI; K.W. Bowyer, co-PI), 2004–2006.
- ‘Multi-Source Image Correlation & Analysis’, Air Force Research Laboratories (Rome Labs), \$75,000, 2004–2005 (co-PI with R.L. Stevenson and K.W. Bowyer).
- ‘Center for Advanced Biometric Research and Evaluation,’ US Department of Justice, \$300,000, 2004–2006 (co-PI with Kevin Bowyer and Dimitris Samaras (SUNY-Stony Brook)).
- ‘Data Sets, Baseline Performance Reference Points, and Evaluation Metrics for HumanID’, DARPA/ONR, \$1,095,000, 2002–2004 (co-PI with Kevin Bowyer).
- ‘Perceptual Learning’, Univ. of Notre Dame (College of Arts and Letters multiyear collaborative research grant program), \$75,000, 2002–2003 (co-PI with Michael Wenger, Kevin Bowyer and Bradley Gibson).
- ‘Building Complete Autonomous Robots’, Univ. of Notre Dame (College of Engineering GE Learning Excellence Fund program), \$55,000, 2002–2003 (co-PI with Matthias Scheutz and Alan Bowling).
- ‘Data Sets, Baseline Performance Reference Points, and Evaluation Metrics for HumanID’, DARPA/ONR (subcontract from U. of South Florida), \$158,000, 2001–2002 (co-PI with Kevin Bowyer).
- ‘Remote Gait Analysis’, Ameritech Foundation/The Ohio State University, \$20,000, 2001–2002 (co-PI with Richard Parent).
- ‘Hierarchical Segmentation and Attribution of High Resolution Aerial Images with a View to Change Detection and Analysis’, NASA, \$200,000, 2000–2001 (co-PI with Kim Boyer, Song-Chun Zhu).
- ‘Vehicle Occupant Motion Detection and Analysis’, Honda R&D, \$60,000, 2000–2001 (co-PI with Kim Boyer).
- ‘Model-Based Object Recognition using Multiple Sensor Modalities and Invariant Techniques’, Air Force Research Laboratory/Dayton Area Graduate Studies Institute/Veridian Engineering, \$400,000, 2000–2002 (lead PI; co-PIs Kim Boyer,

Mark Oxley (AFIT), Kirk Sturtz (Veridian), Gregory Arnold, Vincent Velten (AFRL)).

- ‘Lossy Image Compression in an ATR Context’, Air Force Research Laboratory, \$40,000, 2000–2001 (lead PI; co-PI Stan Ahalt).
- ‘Integration of Wave Theory and Statistical Pattern Classification for Ultrasound Imaging of Breast Tumors,’ NSF, \$85,000, 1997–1999 (co-PI with Shira Broschat).
- ‘Advanced Imaging Algorithms for an Optical Sonography Imaging System,’ Washington Technology Center and Advanced Diagnostics, Inc., \$73,000 (cash) plus \$245,000 (in-kind), 1997–1999 (lead PI; co-PIs Shira Broschat and Russell Tucker).
- ‘Visualization and Animation of Acoustic Propagation,’ ONR, \$3,500, 1996 (co-PI with Shira Broschat and John Schneider).
- ‘Recurrent Modeling,’ NSF, \$206,000, 1996–1999, (co-PI with John Hart).
- ‘Model-Based Recognition of Free-Form Objects,’ NSF, \$196,000, 1995–1999 (PI).
- ‘Interactive and Automatic Recurrent Modeling Research,’ Intel, \$93,000, 1995–1997 (co-PI with John Hart).
- ‘Monte Carlo Simulations of Acoustic Propagation Through Shallow Water,’ \$50,000, ONR, 1995–1996 (co-PI with Shira Broschat and John Schneider).
- ‘REU Supplement to IRI-9209212,’ NSF, \$4,000, 1994–1995.
- ‘Monte Carlo Simulations of Acoustic Propagation Through Shallow Water,’ ONR, \$55,000, 1994 (co-PI with Shira Broschat and John Schneider).
- ‘Model-Based Vision for 3D Objects,’ Washington Technology Center, \$80,000, 1993–1995 (co-PI with Linda Shapiro).
- ‘3D Object Recognition Using Real World Multispectral Imagery,’ Boeing Defense and Space Group, \$30,000, Electronic Systems Division, 1993 (PI).
- ‘Feature Group Utility in Model-Based Object Recognition Systems,’ NSF (CISE Research Initiation Award), \$100,000, 1992–1995 (PI).
- ‘Scaling Behavior in 3D Object Recognition Systems,’ Washington State University Research Grant-in-Aid program, \$13,000, 1992–1993 (PI).
- ‘Reliable Surface Parameter Estimation in Three-Dimensional Vision,’ Jesse H. Jones Faculty Research Fund, University of Notre Dame, \$10,000, 1991–1992 (co-PI with Robert Stevenson).

Equipment/Software

- ‘Instrumentation for Multidimensional Imaging and Applications’, NSF, \$249,000 (including \$83,000 matching funds), 2001–2003 (lead PI; co-PIs Kevin Bowyer, Danny Chen, Robert Stevenson).
- ‘A High Performance Computing and Imaging Facility for Research in Image Understanding and Analysis’, NSF, \$180,000 (including \$60,000 matching funds), 1999–2002 (co-PI with Kim Boyer and Terry Caelli).
- ‘Solid State Device Animation Laboratory,’ NSF, \$102,000, 1996–1998 (co-PI with Mohamed Osman and Roy Rada).

- ‘High-Performance Networking and Computing Infrastructure for Imaging Research,’ NSF, \$160,000 (including \$55,000 matching funds), 1995–1997 (co-PI with Thomas Fischer, John Hart, and Roberto Bamberger).
- ‘Software for Graphics and Animation Production,’ Wavefront Technologies (lead PI, with Kim Singhrs), 1993–1998. This donation consisted of 5-14 licenses of several different software products (Composer, PowerAnimator, etc.) with a list price of approximately \$3.0 million.
- ‘Video Acquisition, Display, and Processing Laboratory,’ NSF, \$80,000, 1992–1993 (co-PI with Thomas Fischer and Roberto Bamberger).
- Animation software gift, Alias Research, Inc., one copy of software valued at \$90,000, 1992 (co-PI with Kim Singhrs).

Advising

All students graduated from Notre Dame with a Computer Science and Engineering graduate degree unless otherwise noted.

Ph.D. Students

- Tanya Peters, Ph.D. candidate (co-advisor with Kevin Bowyer).
- Karen Hollingsworth, Ph.D. candidate (co-advisor with Kevin Bowyer). Expected completion: 2010.
- Robert McKeon, Ph.D. candidate. Expected Completion: 2010.
- LCDR Michael Meredith, Ph.D. candidate. On leave (active duty, USN).
- Deborah Thomas, Ph.D. candidate (co-advisor with Kevin Bowyer). Expected completion: 2009.
- Christopher Boehnen, Ph.D.: *Improving 3D Face Recognition Model Generation and Biometrics*, 2009. Current position: Oak Ridge National Laboratories.
- Tim Faltemeier, Ph.D. (co-advisor with Kevin Bowyer): *Flexible and Robust 3D Face Recognition*, 2007. Current position: Progeny Systems, Inc.
- Xiaomei Liu, Ph.D. (co-advisor with Kevin Bowyer): *Optimizations in Iris Recognition*, 2006. Current position: EMC.
- Xin Chen, Ph.D. (co-advisor with Kevin Bowyer): *Modeling the Human Face Through Multiple View Three-Dimensional Stereopsis: A Survey and Comparative Analysis of Facial Recognition Over Multiple Modalities*, 2006. Current Position: NAVTEQ Corp.
- Kyong (Jin) Chang, Ph.D. (co-advisor with Kevin Bowyer): *New Multi-Biometric Approaches for Improved Person Identification*, 2004. Current position: Philips Medical Imaging.
- Damon Woodard, Ph.D.: *Finger Surface as a Biometric Identifier*, 2004. Current position: faculty member, Clemson University.
- Richard Campbell, Ph.D. (Electrical Engineering, Ohio State): *Recognition of Free-Form 3D Objects in Range Data using Global and Local Features*, 2001. Employment: Sharp Microelectronics Laboratories.

M.S. and B.S. Thesis Advising

- Tanya Peters, M.S., 2009 (co-advised with Kevin Bowyer).
- Sarah Baker, M.S., 2010 (co-advised with Kevin Bowyer).
- Christopher Fallin, B.S. (Hons.): *Automatic Face Feature Localization for Face Recognition*, 2009.
- Karen Hollingsworth, M.S., *Sources of Error in Iris Biometrics*, 2008.
- Christopher Boehnen, M.S., *A Multi-Modal Approach to Frontal and Non Frontal Facial Feature Detection*, 2005.
- Haoshu Wang, M.S., *Eye Location Sensitivity in Face Recognition*, 2004.
- Xin Chen, M.S., *PCA-Based Face Recognition in Infrared Imagery: Baseline and Comparative Studies*, 2003.
- Gerald Dalley, B.S. (Electrical Engineering, with distinction, Ohio State), *A Software Testbed for Registration of Range Images*, 2000.
- Anand Kalyanaraman, M.S. (Electrical Engineering, Ohio State), *Edge Based Artifact Mitigation in a SPIHT Coding Framework*, 2000.
- Ruming Yin, M.S. (Electrical Engineering, Washington State; co-advisor with Shira Broschat), *Position-Dependent Defocus Processing in Optical Sonography*, 1999.
- Xiangrong Wang, M.S. (Computer Science, Washington State): *Implementation and Experiments with a Factorization-Based Structure from Motion Method*, 1995.
- Yan Chen, M.S. (Computer Science, Washington State; co-advisor with Shira Broschat): *Aggressive Region Growing with Various Filtering Techniques for Speckle Reduction*, 1995.
- Richard Campbell, M.S. (Electrical Engineering, Washington State): *Range Image Segmentation via Presegmentation and Quadric Surface Extraction*, 1995.
- Matthew Howell, M.S. (Computer Science, Washington State): *Adapting Geometric Hashing to Account for Sensor Error*, 1994.
- Samir Kapoor, M.S. (Electrical Engineering, Washington State): *Estimation of Motion Parameters for Single and Multiple Mobile Objects*, 1994.
- Jian Guo, M.S. (Computer Science, Washington State): *Curvature Estimation from Range Data*, 1994.
- Hongjiu Lu, M.S. (Computer Science, Washington State): *Ground State Texture Patterns for the Second-order Ising Model*, 1993.
- Zhiya Cai, M.S. (Computer Science, Washington State): *Design and Implementation of a 2D Geometric Modeler*, 1993.
- Bryan Triplett, M.S. (Computer Science, Washington State): *Resolution-Dependent Display of Quadric and Superquadric Surfaces*, 1992.
- Vinod Chandran, M.S. (Computer Science, Washington State): *Affine-Invariant Object Recognition Using the Radon Transform*, 1991.

Publications

Books

- A.K. Jain and P.J. Flynn (eds.), *Three-Dimensional Object Recognition Systems*, Elsevier Science Publishers, 1993.
- A.K. Jain, P.J. Flynn and A. Ross (eds.), *Handbook of Biometrics*, Springer, 2007.

Book Chapters

- P. Flynn, “Biometric Databases”, *Handbook of Biometrics* (Jain, Flynn and Ross, eds.), Springer-Verlag, 2007.
- P. Flynn, T. Faltemier and K. Bowyer, 3D Face Recognition, *Handbook of Biometrics* (Jain, Flynn and Ross, eds.), Springer-Verlag, 2007.
- A.K. Jain and P.J. Flynn, ‘Image Segmentation Using Clustering,’ *Advances in Image Understanding: A Festschrift for Azriel Rosenfeld*, N. Ahuja and K. Bowyer (eds.), IEEE Computer Society Press, pp. 65-83, 1996.
- P.J. Flynn and A.K. Jain, ‘Three-Dimensional Object Recognition,’ *Handbook of Pattern Recognition and Image Processing*, volume 2, T.Y. Young (ed.), Academic Press, pp. 497-541, 1994.
- J. Mao, A.K. Jain and P.J. Flynn, ‘Integration of Multiple Feature Groups and Multiple Views into a 3D Object Recognition System,’ in *Lecture Notes in Computer Science 825, Applications of Invariance in Computer Vision*, J. Mundy, A. Zisserman and D. Forsyth (eds.), Berlin:Springer-Verlag, 1994, pp. 381-394.

Refereed Journal Publications

1. Hoang Bui, Michael Kelly, Christopher Lyon, Mark Pasquier, Deborah Thomas, Patrick Flynn and Douglas Thain, Experience with BXGrid: a data repository and computing grid for biometrics research, *Cluster Computing*, 2009. DOI: 10.1007/s10586-009-0098-7.
2. Karen Hollingsworth, Kevin W. Bowyer and Patrick J. Flynn, The Best Bits in an Iris Code, *IEEE Trans. on Pattern Analysis and Machine Intelligence* **31**(6):964-973, June 2009. DOI:10.1109/TPAMI.2008.185
3. Karen Hollingsworth, Kevin W. Bowyer and Patrick J. Flynn, Pupil Dilation Degrades Iris Biometric Performance, *Computer Vision and Image Understanding* **113**:150-157, 2009. DOI:10.1016/j.cviu.2008.08.01
4. Timothy C. Faltemier, Kevin W. Bowyer and Patrick J. Flynn, Using Multi-Instance Enrollment to Improve Performance 3D Face Recognition, *Computer Vision and Image Understanding* **112**(2):114-125, November 2008. DOI:10.1016/j.cviu.2008.01.004
5. K.W. Bowyer, K. Hollingsworth and P.J. Flynn, Image understanding for iris biometrics: a survey, *Computer Vision and Image Understanding* **110**:281-307, 2008. DOI:10.1016/j.cviu.2007.08.005
6. T.C. Faltemier, K.W. Bowyer and P.J. Flynn, A Region Ensemble for 3-D Face Recognition, *IEEE Trans. on Information Forensics and Security* **3**(1):62-73, March 2008. DOI:10.1109/TIFS.2007.916287

7. P. Jonathon Phillips, Kevin W. Bowyer and Patrick J. Flynn, 'Comment on the CASIA version 1.0 Iris Dataset', *IEEE Trans. on Pattern Analysis and Machine Intelligence* **29**(10):1869-870, October 2007. DOI:10.1109/TPAMI.2007.1137
8. Kevin Bowyer, Kyong Chang, Patrick Flynn and Xin Chen, 'Face Recognition using 2D, 3D and Infra-Red: Is Multi-Modal Better than Multi-Sample?', *Proceedings of the IEEE* **94**(11):2000-2012, November 2006. DOI: 10.1109/JPROC.2006.885134
9. Kyong Chang, Kevin Bowyer, and Patrick Flynn, 'Multiple Nose Region Matching for 3D Face Recognition under Varying Facial Expression', *IEEE Trans. on Pattern Analysis and Machine Intelligence* **28**(10):1695-1700, October 2006. DOI:10.1109/TPAMI.2006.210
10. Damon Woodard and Patrick Flynn, 'Exploiting the Finger Surface as a Biometric Identifier,' *Computer Vision and Image Understanding* **100**(3):357-384, December 2005. DOI:10.1016/j.cviu.2005.06.003
11. Kyong Chang, Kevin Bowyer, and Patrick Flynn, 'A Survey of Approaches and Challenges in 3D and Multi-Modal 2D+3D Face Recognition', *Computer Vision and Image Understanding* **101**(1):1-15, January 2006. DOI:10.1016/j.cviu.2005.05.005
12. Xin Chen, Patrick Flynn, and Kevin Bowyer, 'IR and Visible Light Face Recognition', *Computer Vision and Image Understanding* **99**(3):332-358, September 2005. DOI:10.1016/j.cviu.2005.03.001
13. Kevin W. Bowyer, Kyong Chang and Patrick Flynn, 'An Evaluation of Multimodal 2D+3D Face Biometrics', *IEEE Trans. on Pattern Analysis and Machine Intelligence* **27**(4):619-624, April 2005. DOI:10.1109/TPAMI.2005.70
14. Xiaodong Zhang, Shira Broschat and Patrick Flynn, 'A Numerical Study of Conjugate Gradient Directions for an Ultrasound Inverse Imaging Problem', *J. Computational Acoustics* **12**(4):587-604, December 2004. DOI:10.1142/S0218396X04002377
15. Richard Campbell and Patrick Flynn, 'Free-Form Object Recognition in Range Data Using Weak Correspondence Between Local Features', *Int. J. Pattern Recognition and Artificial Intelligence* **17**(7):1245-1277, November 2003.
16. Yan Chen, Patrick Flynn and Shira Broschat, 'Aggressive Region Growing for Speckle Reduction in Ultrasound Images,' *Pattern Recognition Letters*, **24**(4-5):677-691, February 2003. DOI:10.1016/S0167-8655(02)00174-5
17. Xiaodong Zhang, Shira Broschat and Patrick Flynn, 'A Conjugate Gradient Neural Network Technique for Ultrasound Inverse Imaging', *J. Computational Acoustics* **10**(2):243-264, 2002. DOI:10.1121/1.422308
18. Kim Boyer, Ravi Srikantiah, and Patrick Flynn, 'Saliency Sequential Surface Organization for Free Form Object Recognition,' *Computer Vision and Image Understanding* **88**(3):152-188, December 2002. doi:10.1006/cviu.2002.0973
19. Gerald Dalley and Patrick Flynn, 'Pair-Wise Range Image Registration: A Study in Outlier Classification,' *Computer Vision and Image Understanding* **87**(1/2/3):104-115, July-September 2002. DOI:10.1006/cviu.2002.0986
20. Ruming Yin, Patrick Flynn and Shira Broschat, 'Position-Dependent Defocus Processing for Ultrasound Holographic Images,' *Int. J. Imaging Science and Tech.* **12**(3), September 2002.

21. Xiaodong Zhang, Shira Broschat and Patrick Flynn, 'A Comparison of Material Classification Techniques for Ultrasound Inverse Imaging', *J. Acoust. Soc. Amer.* **111**(1):457-467 (Part 1), January 2002. DOI:10.1121/1.1424869
22. Richard Campbell and Patrick Flynn, 'A Survey of Free-form Object Representation and Recognition Techniques', *Computer Vision and Image Understanding*, **81**(2):166-210, 2001. DOI:10.1006/cviu.2000.0889
23. Anil Jain, M.N. Murty and Patrick Flynn, 'Cluster Analysis: A Review', *ACM Computing Surveys* **31**(3):264-323, September 1999. DOI:10.1145/331499.331504
24. John Hart, Wayne Cochran and Patrick Flynn, 'Similarity Hashing: A Computer Vision Solution to the Inverse Problem of Linear Fractals,' *Fractals J.*, May 1997.
25. John Schneider, Patrick Flynn and Kurt Shlager, 'Animating the Evolution of a Two-Dimensional Field,' *IEEE Antennas and Propagation Magazine* **38**(6):7-17, 1996.
26. John Hart, Wayne Cochran and Patrick Flynn, 'Fractal Volume Compression,' *IEEE Transactions on Visualization and Computer Graphics* **4**(2):313-322, December 1996.
27. Adam Hoover, Gillian Jean-Baptiste, Xiaoyi Jiang, Patrick Flynn, Horst Bunke, Dmitry Goldgof, Kevin Bowyer, David Eggert, Andrew Fitzgibbon and Robert Fisher, 'An Experimental Comparison of Range Image Segmentation Techniques,' *IEEE Transactions on Pattern Analysis and Machine Intelligence* **18**(7):673-689, July 1996.
28. Patrick Flynn, 'Realistic Range Rendering,' *Image and Vision Computing* **14**(7):465-472, July 1996.
29. Yan Chen, Shira Broschat and Patrick Flynn, 'Phase Insensitive and Homomorphic Image Processing for Speckle Reduction,' *Ultrasound Imaging* **18**(2):122-139, April 1996.
30. Jianchang Mao, Anil Jain and Patrick Flynn, 'Integration of Multiple Feature Groups and Multiple Views into a 3D Object Recognition System,' *Computer Vision, Graphics, and Image Processing: Image Understanding* **62**(3):309-325, November 1995.
31. Patrick Flynn, '3D Object Recognition With Symmetric Models: Symmetry Extraction and Encoding,' *IEEE Transactions on Pattern Analysis and Machine Intelligence* **16**(8):814-817, August 1994.
32. John Moody, Patrick Flynn and David Cohn, 'Parallel Hypothesis Verification,' *Pattern Recognition* **26**(10):1521-1527, October 1993.
33. Timothy Newman, Patrick Flynn and Anil Jain, 'Model-Based Classification of Quadric Surfaces,' *Computer Vision, Graphics, and Image Processing: Image Understanding* **58**(2):235-249, September 1993.
34. Patrick Flynn and Anil Jain, '3D Object Recognition Using Invariant Feature Indexing of Interpretation Tables,' *Computer Vision, Graphics, and Image Processing: Image Understanding* **55**(2):119-129, March 1992.
35. Patrick Flynn and Anil Jain, 'BONSAI: 3D Object Recognition Using Constrained Search,' *IEEE Transactions on Pattern Analysis and Machine Intelligence* **13**(10):1066-1075, October 1991.

36. Patrick Flynn and Anil Jain, 'CAD-Based Computer Vision: From CAD Models to Relational Graphs,' *IEEE Transactions on Pattern Analysis and Machine Intelligence* **13**(2):114-132, February 1991. Reprinted in *Computer Vision: Advances and Applications*, R. Kasturi and R. Jain (eds.), IEEE Computer Society Press, pp. 228-246, 1991. Reprinted in *Selected Papers on Model-Based Vision*, H. Nasr (ed.), SPIE Vol. MS72 (Milestone Series), SPIE Press, 1993.
37. Torfinn Taxt, Patrick Flynn and Anil Jain, 'Segmentation of Document Images,' *IEEE Transactions on Pattern Analysis and Machine Intelligence* **11**(12):1322-1328, December 1989.
38. William Byrne, Patrick Flynn, Roland Zapp and Marvin Siegel, 'Adaptive Filter Signal Processing in Microwave Remote Heart Monitors,' *IEEE Transactions on Biomedical Engineering* **BME-33**(7):717-721, July 1986.

Papers and Abstracts in Proceedings of Refereed Conferences

1. Chris Boehnen, Tanya Peters, Patrick J. Flynn, 3D Signatures for Fast 3D Face Recognition, Proc. 2009 Int. Conf. on Biometrics (ICB 2009), pp. 12-21, Alghero, June 2009. This paper won the **Best Student Paper** award at ICB 2009.
2. P. Jonathon Phillips, Patrick J. Flynn, J. Ross Beveridge, W. Todd Scruggs, Alice J. O'Toole, David S. Bolme, Kevin W. Bowyer, Bruce A. Draper, Geof H. Givens, Yui Man Lui, Hassan Sahibzada, Joseph A. Scallan, Samuel Weimer, Overview of the Multiple Biometrics Grand Challenge, Proc. 2009 Int. Conf. on Biometrics (ICB 2009), pp. 705-714, Alghero, June 2009.
3. Karen Hollingsworth, Kevin W. Bowyer, Patrick J. Flynn, Image Averaging for Improved Iris Recognition, Proc. 2009 Int. Conf. on Biometrics (ICB 2009), pp. 1112-1121, Alghero, June 2009.
4. Sarah E. Baker, Kevin W. Bowyer, Patrick J. Flynn, Empirical Evidence for Correct Iris Match Score Degradation with Increased Time-Lapse between Gallery and Probe Matches. Proc. 2009 Int. Conf. on Biometrics (ICB 2009), pp. 1170-1179, Alghero, June 2009.
5. K. Hollingsworth, K. Bowyer and P. Flynn, The Importance of Small Pupils: A Study of How Pupil Dilation Affects Iris Biometrics, Proc. 2nd Int. Conf on Biometrics: Theory, Applications and Systems (BTAS 2008), September 2008, Washington DC.
6. K. Hollingsworth, K. Bowyer and P. Flynn, All Iris Filters Are Not Created Equal, Proc. 2nd Int. Conf on Biometrics: Theory, Applications and Systems (BTAS 2008), September 2008, Washington DC.
7. C. Boehnen and P. Flynn, Increased Resolution 3D Face Modeling and Recognition from Multiple Low Resolution Structure From Motion Models, Proc. 2nd Int. Conf. on Biometrics: Theory, Applications and Systems (BTAS 2008), September 2008, Washington, DC.
8. Deborah Thomas, Kevin W. Bowyer and Patrick J. Flynn, Multi-factor approach to improving recognition performance in surveillance-quality video, Proc. 2nd Int. Conf. on Biometrics: Theory, Applications and Systems (BTAS 2008), September 2008, Washington, DC.

9. James Gentile, Kevin W. Bowyer and Patrick J. Flynn, Profile face detection: a subset multi-biometric approach, Proc. 2nd Int. Conf on Biometrics: Theory, Applications and Systems (BTAS 2008), September 2008, Washington, DC.
10. P. Jonathon Phillips, Kevin W. Bowyer, Patrick J. Flynn, Xiaomei Liu and W. Todd Scruggs, The Iris Challenge Evaluation 2005, Proc. 2nd Int. Conf on Biometrics: Theory, Applications and Systems (BTAS 2008), September 2008, Washington DC.
11. Christopher Moretti, Jared Bulosan, Douglas Thain, and Patrick J. Flynn, All-Pairs: An Abstraction for Data-Intensive Cloud Computing, Proc. IPDPS 2008, April 2008.
12. K. Hollingsworth, K. Bowyer and P. Flynn, All Iris Bits Are Not Created Equal, Proc. 1st Int. Conf on Biometrics: Theory, Applications and Systems (BTAS 2007), September 2007, Washington DC.
13. Vince Thomas, Nitesh Chawla, Kevin W. Bowyer, and Patrick J. Flynn, Learning to Predict Gender from Irises, Proc. 1st Int. Conf on Biometrics: Theory, Applications and Systems (BTAS 2007), September 2007, Washington DC.
14. Timothy Faltemier, Kevin Bowyer and Patrick J. Flynn, Using a Multi-instance Enrollment Representation to Improve 3D Face Recognition, Proc. 1st Int. Conf on Biometrics: Theory, Applications and Systems (BTAS 2007), September 2007, Washington DC.
15. Ross Beveridge, Patrick Flynn, Andres Alvarez, Jilmil Saraf, Ward Fisher, and James Gentile, Face Detection Algorithm and Feature Performance on FRGC 2.0 Imagery Proc. 1st Int. Conf on Biometrics: Theory, Applications and Systems (BTAS 2007), September 2007, Washington DC.
16. C. Moretti, T. Faltemier, D. Thain and P. Flynn, 'Challenges in Executing Data Intensive Biometric Workloads on a Desktop Grid', *Proc. Workshop on Large Scale and Volatile Desktop Grids (PCGRID)* at IPDPS, Long Beach, March 2007.
17. Deborah Thomas, Kevin W. Bowyer, Patrick J. Flynn, 'Multi-frame Approaches To Improve Face Recognition', Proc. IEEE Workshop on Motion and Video Computing (WMVC'07), p. 19, 2007.
18. X. Chen, T. Faltemier, P. Flynn and K. Bowyer, 'Human Face Modeling and Recognition Through Multi-View High Resolution Stereopsis', *Proc. Workshop on Biometrics* (affiliated with CVPR 2006), New York, June 2006.
19. M. Wittman, P. Davis and P. Flynn, 'Empirical Studies of the Existence of the Biometric Menagerie in the FRGC 2.0 Image Corpus', *Proc. Workshop on Biometrics* (affiliated with CVPR 2006), New York, June 2006.
20. Timothy Faltemier, Kevin Bowyer and Patrick Flynn, '3D Face Recognition with Curvature Based Region Selection', *Proc. 3DPVT 2006*, Chapel Hill, June 2006.
21. K. W. Bowyer, K. I. Chang, P. Yan, P. J. Flynn, E. Hansley, S. Sarkar, 'Multi-modal Biometrics: An Overview', *Proc. MMUA 2006*, Toulouse, May 2006.
22. Xin Chen, Patrick Flynn, Kevin Bowyer, 'Fusion of Infrared and Range Data: Multi-modal Face Images', *Proc. IAPR Int. Conf. on Biometrics*, Jan. 2006.
23. Xin Chen, Patrick J. Flynn, and Kevin W. Bowyer, Fully automated facial symmetry axis detection in frontal color images, *Proc. Fourth IEEE Workshop On Automatic Identification Advanced Technologies (AutoID 2005)*, October 2005, Buffalo, New York, 106-111.

24. Xiaomei Liu, Kevin W. Bowyer, Patrick J. Flynn, Iris recognition and verification experiments with improved segmentation method, *Proc. Fourth IEEE Workshop On Automatic Identification Advanced Technologies (AutoID 2005)*, October 2005, Buffalo, New York, 118-123.
25. Jaesik Min, Kevin Bowyer, and Patrick Flynn, 'Eye Perturbation Approach for Robust Recognition of Inaccurately Aligned Faces', *Proc. AVBPA 2005, Lecture Notes in Computer Science*, 3546:41-50, Rye Town, NY, July 2005.
26. Haoshu Wang and Patrick J. Flynn, 'Experimental Evaluation of Eye Location Accuracies and Time-Lapse Effects on Face Recognition Systems', *Proc. AVBPA 2005, Lecture Notes in Computer Science*, 3546:627-636, Rye Town, NY, July 2005.
27. Damon Woodard and Patrick J. Flynn, 'Identity Verification Utilizing Finger Surface Features', *Proc. AVBPA 2005, Lecture Notes in Computer Science*, 3546:544-554, Rye Town, NY, July 2005.
28. Kyong I. Chang, Kevin W. Bowyer, Patrick J. Flynn, 'Adaptive Rigid Multi-region Selection for Handling Expression Variation in 3D Face Recognition', *Proc. Face Recognition Grand Challenge Workshop*, San Diego, June 2005.
29. Xiaomei Liu, Kevin W. Bowyer, Patrick J. Flynn, 'Experimental Evaluation of Iris Recognition', *Proc. Face Recognition Grand Challenge Workshop*, San Diego, June 2005.
30. Christopher Boehnen and Patrick Flynn, 'Accuracy of 3D Scanning Technologies in a Face Scanning Context', *Proc. 5th Int. Conf. on 3-D Digital Imaging and Modeling (3DIM 2005)*, Ottawa, pp. 310-317, June 2005.
31. P. Jonathon Phillips, Patrick J. Flynn, Todd Scruggs, Kevin W. Bowyer, Jin Chang, Kevin Hoffman, Joe Marques, Jaesik Min and William Worek, 'Overview of the Face Recognition Grand Challenge', *Proc. CVPR 2005*, pp. I:947-954, June 2005.
32. Damon L. Woodard and Patrick J. Flynn, 'Personal Identification Utilizing Finger Surface Features,' *Proc. CVPR 2005*, pp. II:103-1036, June 2005.
33. Michael G. Wittman, James M. Ward and Patrick J. Flynn, Visual analysis of the effects of load carriage on gait, *Proc. Biometric Technology for Human Identification II* (SPIE Vol. 5779), Orlando, pp. 15-22, March 2005.
34. Kyong Chang, Damon Woodard, Patrick Flynn and Kevin Bowyer, 'Three-Dimensional Face and Finger Biometrics', *Proc. EUSIPCO*, September 2004.
35. Kyong Chang, Kevin Bowyer, and Patrick Flynn, 'A Survey of Approaches to Three-Dimensional Face Recognition', *Proc. ICPR 2004*, vol. 1, pp. 358-361, August 2004. **Reprinted** in *Journal of Intelligence Community Research and Development*.
36. Kyong Chang, Kevin Bowyer, and Patrick Flynn, 'Multi-biometrics using Facial Appearance, Shape, and Temperature', *Proc. 6th IEEE Int. Conf. on Automatic Face and Gesture Recognition (FG2004)*, May 2004, Seoul, pp. 43-48.
37. Damon L. Woodard and Patrick J. Flynn, '3D Finger Biometrics', *Proc. Biometric Authentication Workshop*, May 2004, Prague, Lecture Notes in Computer Science v. 3087, Springer-Verlag, pp. 238-247.

38. Patrick Flynn, Kevin Bowyer, and Aman Jain, 'New Approach to Non-frontal Face Recognition', *Proc. Biometric Technology for Human Identification*, SPIE Int. Symp. on Defense and Security, Orlando, April 2004, pp. 87-93.
39. Kyong Chang, Kevin Bowyer, Patrick Flynn, and Xin Chen, 'Multi-Modal Biometrics Using Appearance, Shape and Temperature', *Proc. Biometric Technology for Human Identification*, SPIE Int. Symp. on Defense and Security, Orlando, April 2004, pp. 1-11.
40. Kyong Chang, Kevin Bowyer, and Patrick Flynn, 'Face Recognition using 2D and 3D Facial Data', *Proc. ACM Workshop on Multimodal User Authentication*, Santa Barbara, December 2003, pp. 25-32. **Reprinted** in *Journal of Intelligence Community Research and Development*.
41. Xin Chen, Patrick Flynn and Kevin Bowyer, 'Visible-light and infrared face recognition', *Proc. ACM Workshop on Multimodal User Authentication*, Santa Barbara, December 2003, pp. 48-55. **Reprinted** in *Journal of Intelligence Community Research and Development*.
42. Xin Chen, Patrick Flynn and Kevin Bowyer, 'PCA-Based Face Recognition in Infrared Imagery: Baseline and Comparative Studies', *Proc. IEEE International Workshop on Analysis and Modeling of Faces and Gestures (AMFG 2003)*, Nice (France), Oct. 2003, 127-134.
43. Kyong Chang, Kevin Bowyer, and Patrick Flynn, '2D and 3D Multi-Modal Biometrics in Face Identification using PCA-based method,' *Proc. IEEE International Workshop on Analysis and Modeling of Faces and Gestures (AMFG 2003)*, Nice (France), Oct. 2003.
44. Patrick Flynn, Kevin Bowyer and Jonathon Phillips, 'Assessment of Time Dependency in Face Recognition: An Initial Study,' *Proc. 2003 Workshop on Audio Video Biometric Person Authentication*, June 2003, Surrey, Lecture Notes in Computer Science 2688:44-51, Springer-Verlag.
45. Richard Campbell and Patrick Flynn, 'Recognition of Free-form Objects in Dense Range Data Using Local Features', *Proc. 16th Int. Conf. Pattern Recognition*, vol. 3, pp. 607-610, August 2002.
46. Prabhu Krishnamoorthy, Patrick Flynn, Kim Boyer, 'Robust Detection of Buildings in Digital Surface Models,' *Proc. 16th. Int. Conf. Pattern Recognition*, vol. 1, p. 159-163, August 2002.
47. Richard Campbell and Patrick Flynn, 'Experiments in Transform-Based Compression of Range Data', *Proc. 16th. Int. Conf. Pattern Recognition*, vol. 3, pp. 875-878, August 2002.
48. Ravi Srikantiah, Kim Boyer, Patrick Flynn, 'Multiscale Surface Organization and Description for Free-Form Object Recognition', *Proc. 16th. Int. Conf. Pattern Recognition*, vol. 3, pp. 569-572, August 2002.
49. Gerald Dalley and Patrick Flynn, 'Range Image Registration: A Software Platform and Empirical Evaluation,' *Third International Conference on 3D Digital Imaging and Modeling (3DIM 2001)*, pp. 246-253, 2001.
50. Anand Kalyanaraman and Patrick Flynn, 'Edge-Based Artifact Mitigation in a Wavelet Transform Coding Framework,' *Proc. 2001 Data Compression Conference*, March 2001.

51. Ruming Yin, Patrick Flynn and Shira Broschat, 'Position-Dependent Defocus Processing for Ultrasound Holographic Images,' *Proc. 138th Meeting, Acoustical Society of America*, Nov. 1999.
52. Xiaodong Zhang, Shira Broschat, and Patrick Flynn, 'Inverse Imaging of the Breast using the Conjugate Gradient-Bivariate Material Classification Technique,' *Proc. 1999 IEEE International Ultrasonics Symposium*, Lake Tahoe, NV, Oct. 1999.
53. Suba Varadarajan, Xiaoning Fu, Richard Parent, Kathy Johnson, and Patrick Flynn, '3D Gait Reconstruction Using Two-Camera Markerless Video', *Proc. SIGGRAPH 1999 Technical Sketches* (Computer Graphics Conference Abstracts and Applications Annual Conference Series), 1999, ACM SIGGRAPH, p. 224.
54. Richard Campbell and Patrick Flynn, 'Eigenshapes for 3D Object Recognition in Range Data', *Proc. IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR '99)*, pp. 505-510.
55. Xiaodong Zhang, Shira Broschat, and Patrick Flynn, 'Inverse imaging of the breast using a conjugate gradient-neural network technique', *Proc. 1998 ICA/ASA joint meeting*, June 1998, Seattle.
56. Yan Chen, Ruming Yin, Patrick Flynn, and Shira Broschat, 'Aggressive region growing filtering for speckle reduction in ultrasound images', *Proc. 1998 ICA/ASA joint meeting*, June 1998, Seattle.
57. Wayne Cochran, John Hart and Patrick Flynn, 'On Approximating Rough Curves with Fractal Functions,' *Proc. Graphics Interface '98*, Vancouver, June 1998.
58. Richard Campbell and Patrick Flynn, 'Model and Image Features for Free-Form Object Recognition,' *Proc. Vision Interface '98*, Vancouver, June 1998.
59. Richard Campbell and Patrick Flynn, 'A WWW-Accessible Image and Model Database for Computer Vision Research', *Proc. IEEE Workshop on Empirical Evaluation Methods in Computer Vision*, Santa Barbara, June 1998.
60. Dhiraj Kacker, Robert Bamberger and Patrick Flynn, 'New Subband Geometries for Image Texture Segmentation,' *Proc. IEEE Int. Conf. on Image Processing (ICIP-96)*, vol. III, 971-974, 1996.
61. Adam Hoover, Gillian Jean-Baptiste, Xiaoyi Jiang, Patrick Flynn, Horst Bunke, Dmitry Goldgof and Kevin Bowyer, 'Range Image Segmentation: The User's Dilemma,' *Proc. IEEE Int. Symp. Computer Vision*, 323-328, 1995.
62. Jianxin Hou, Robert Bamberger and Patrick Flynn, 'A Robust System for Lineament Analysis of Aero-magnetic Imagery Using Orientation Analysis and Edge Linking,' *Proc. IEEE Int. Conf. on Image Processing (ICIP-94)*, 963-967, 1994.
63. Matthew Howell and Patrick Flynn, 'Guaranteed Geometric Hashing,' *Proc. Twelfth International Conference on Pattern Recognition*, Jerusalem, 465-469, 1994.
64. Patrick Flynn, 'Realistic Range Rendering,' *Proc. IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR '94)*, 848-851, 1994.
65. Jianchang Mao, Anil Jain and Patrick Flynn, 'Integration of Multiple Feature Groups and Multiple Views into a 3D Object Recognition System,' *Proc. 2nd IEEE Computer Society CAD-Based Vision Workshop*, 184-191, 1994. **Reprinted**

- in *Applications of Invariance in Computer Vision* (Lecture Notes in Computer Science vol. 825), Berlin:Springer-Verlag, 1994, pp. 381-394.
66. Hongjiu Lu and Patrick Flynn, 'Ground State Texture Patterns for the Second-Order Ising Model,' *Proc. IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR '93)*, 636-637, 1993.
 67. John Moody, Patrick Flynn and David Cohn, 'Parallel Hypothesis Verification,' *Proc. Eleventh International Conference on Pattern Recognition*, The Hague (Netherlands), vol. 4, 107-110, 1992.
 68. Patrick Flynn, 'Saliencies and Symmetries: Toward 3D Object Recognition from Large Model Databases,' *Proc. IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR '92)*, 322-327, 1992.
 69. Patrick Flynn and Anil Jain, 'On a Taxonomy of Interpretation Trees,' *Proc. SPIE Conference on Intelligent Robots and Computer Vision X: Algorithms and Techniques* (SPIE vol. 1607), 548-558, 1991.
 70. Timothy Newman, Patrick Flynn and Anil Jain, 'Model-Based Surface Classification,' *Proc. SPIE Conference on Geometric Methods in Computer Vision* (SPIE vol. 1570), 250-261, 1991.
 71. Patrick Flynn and Anil Jain, '3D Object Recognition Using Invariant Feature Indexing of Interpretation Tables,' *Proc. IEEE Workshop on Directions in Automated 'CAD-Based' Vision*, 115-123, 1991.
 72. Patrick Flynn and Anil Jain, 'BONSAI: 3D Object Recognition Using Constrained Search,' *Proc. Third International Conference on Computer Vision*, 263-267, 1990.
 73. Torfinn Taxt, Patrick Flynn and Anil Jain, 'Segmentation of Document Images,' *Proc. 1989 IEEE International Conference on Systems, Man, and Cybernetics*, 1062-1067, 1989.
 74. Patrick Flynn and Anil Jain, 'CAD-Based Computer Vision: From CAD Models to Relational Graphs,' *Proc. 1989 IEEE International Conference on Systems, Man, and Cybernetics*, 162-167, 1989.
 75. Patrick Flynn and Anil Jain, 'On Reliable Curvature Estimation,' *Proc. IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR '89)*, 110-116, 1989.
 76. Patrick Flynn and Anil Jain, 'Surface Classification: Hypothesis Testing and Parameter Estimation,' *Proc. IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR '88)*, 261-267, 1988.
 77. Patrick Flynn, Gregory Hoshal and Marvin Siegel, 'Vital Life Signs Detection using Microwave Energy and Digital Signal Processing,' *Proc. 1986 Computers in Cardiology Conference*, 505-506, 1986.
 78. William Byrne, Roland Zapp, Patrick Flynn and Marvin Siegel, 'Adaptive Filtering in Microwave Remote Heart Monitors,' *Proc. 7th Annual Conference of the IEEE Engineering in Medicine and Biology Society*, 1196-1199, 1985.

Non-Refereed Articles, Editorials, Technical Reports, and Presentations without Proceedings

1. P. J. Phillips, W. T. Scruggs, A. J. O'Toole, P. J. Flynn, K. W. Bowyer, C. L. Schott, M. Sharpe, "FRVT 2006 and ICE 2006 Large-Scale Results", National Institute of Standards and Technology, NISTIR 7408, <http://face.nist.gov>, 2007.
2. J. Ward, M. Wittman and P. Flynn, "Visual Analysis of the Effects of Load Carriage on Gait", poster presentation at *Biometrics Consortium Conference 2004*, Washington DC, September 2004.
3. D. Woodard and P. Flynn, "Finger Surface as a Biometric Identifier", presentation at *Biometrics Consortium Conference 2004*, Washington DC, September 2004.
4. J. Min, K. Bowyer, P. Flynn, X. Liu, "Ensemble Eye Location Sampling for Improved Face Recognition Performance", poster presentation at *Biometrics Consortium Conference 2004*, Washington DC, September 2004.
5. Xin Chen, Patrick Flynn and Kevin Bowyer, 'PCA-based face Recognition in Infrared Imagery: Baseline and Comparative Results', *BC2003 Research Symposium*, Arlington VA, Sept. 2003.
6. Damon Woodard and Patrick Flynn, 'Hand Silhouette Curvature Measurements as a Biometric identifier', *BC2003 Research Symposium*, Arlington VA, Sept. 2003.
7. Patrick Flynn, Adam Hoover and Jonathon Phillips, 'Special Issue on Empirical Evaluation of Computer Vision Algorithms,' *Computer Vision and Image Understanding* **84**(1):1-4, October 2001.
8. Kevin Bowyer and Patrick Flynn, 'A 20th Anniversary Survey: Introduction to Content-based Image Retrieval at the End of the Early Years', *IEEE Trans. on Pattern Analysis and Machine Intelligence* **22**(12):1348, December 2000.
9. Kevin Bowyer, Patrick Flynn, and Rangachar Kasturi, 'Editorial: The 20th Anniversary of the IEEE Transactions on Pattern Analysis and Machine Intelligence', *IEEE Trans. on Pattern Analysis and Machine Intelligence* **22**(1):1-3, January 2000.
10. Kevin Bowyer and Patrick Flynn, 'Editorial: Multiple Submission: Professionalism, Ethical Issues, and Copyright Legalities,' *IEEE Trans. on Pattern Analysis and Machine Intelligence* **21**(5):385, May 1999.
11. Patrick Flynn, George Stockman and Octavia Camps, 'Editorial: Progress in CAD-Based Vision: An Introduction to the Special Issue', *Computer Vision and Image Understanding*, March 1998.
12. Shira Broschat, John Schneider, Frank Hastings, and Patrick Flynn, 'Computational and theoretical models for rough surface and bottom scattering,' *Proc. 1997 Int. Conf. on Shallow-Water Acoustics*, Beijing, April 1997.
13. Wayne Cochran, John Hart and Patrick Flynn, 'Hashing Fractal Functions,' *Proc. 1997 Western Computer Graphics Symposium (SKIGRAPH 97)*, Whistler, April 1997.
14. John Schneider, Frank Hastings, Patrick Flynn and Shira Broschat, 'Understanding Acoustic Propagation in Shallow Water via Animations,' abstracted in *Journal of the Acoustical Society of America* **99**(4):2552 (part 2), April 1996.
15. Katsushi Ikeuchi and Patrick Flynn, 'Editorial: Recent Progress in CAD-Based Vision,' *Computer Vision and Image Understanding* **61**(3):293-294, 1995.

16. Wayne Cochran, John Hart, and Patrick Flynn, 'Principal Component Classification for Fractal Volume Compression,' *Proc. 1995 Western Computer Graphics Symposium (SKIGRAPH 95)*, Banff, March 1995.
17. Shira Broschat, John Schneider, and Patrick Flynn, 'Finite Difference Simulations of Propagation in a Shallow Water Environment,' abstracted in *Journal of the Acoustical Society of America* **96**(5):3265 (part 2), November 1994.
18. Jianxin Hou, Ronald Thiessen, Robert Bamberger, and Patrick Flynn, 'Automatic Lineament Interpretation of Aeromagnetic Images of the Hanford Site,' *Geological Society of America Annual Meeting (Abstracts with Programs, Geological Society of America)* **21**(7), October 1994.
19. Jianchang Mao, Anil Jain, and Patrick Flynn, 'Integration of Multiple Feature Groups and Multiple Views into a 3D Object Recognition System,' *Proc. 2nd ESPRIT-ARPA/NSF Workshop on Invariance in Computer Vision*, Ponta Delgada (Azores), pp. 267-286, October 1993.

Films

All films listed are short computer animated subjects produced by students in CS446/546 at Washington State University during 1992-1998, coordinated and taught by K. Singhrs and P.J. Flynn. Film rights for publication are secured through the WSU Research Foundation.

- 'Home Free,' (Jim Fricker and Xiaoling Chen, animators), *Imaginit!*, Miramar Films, 1996.
- 'Greed,' (Sean Jenkins, animator), shown at Eurographics 96, Poitiers, France. Also shown at ACADIA National Workshop (Association for CAD in Architecture), Seattle, 1995.
- 'Bryan Clock Tower,' (Pam Miles *et al.*, animators), shown at ACADIA National Workshop, Seattle, 1995.
- 'WSU Animation 93-94' and 'WSU Animation 94-95,' (class vanity collections) shown at ACADIA National Workshop, Seattle, 1995.

Software and Database Artifacts

- Biometrics Databases – Hundreds of thousands of biometrics samples of various types collected in support of multiple US Government sponsored biometrics evaluation activities. Addresses: <http://www.nd.edu/~cvr1>, <http://face.nist.gov/frgc>, <http://iris.nist.gov/ice>, <http://face.nist.gov/mbgc>.

Invited Presentations

- 2009: Facial Identification Scientific Working Group.
- 2008: Biometrics Cluster Group (Noblis Corp., Washington DC), Biometrics: From Bones to Bits workshop (Booz Allen Hamilton, Washington, DC), 4th Workshop on Computational Vision (UNESP, Bauru, Brazil), Universidade Federal do Parana (Brazil).
- 2007: NAVTEQ Corp; Georg-August-Universität Göttingen, Germany.

- 2006: Indiana University-Purdue University at Indianapolis; Biometrics Summer School, Alghero, Italy.
- 2004: IBM T.J. Watson Research Center.
- 2001: University of Notre Dame.
- 2000: Ohio State University; University of Notre Dame.
- 1999: Michigan State University.
- 1998: Ohio State University.
- 1997: University of Kentucky.
- 1996: Michigan State University; University of Notre Dame.
- 1994: Carnegie Mellon University.
- 1993: Second EEC-US Workshop on Invariance in Computer Vision, Ponta Delgada, Azores; University of South Florida.
- 1992: Curtin University (Perth, Australia); University of Melbourne (Melbourne, Australia); Australian Pattern Recognition Workshop on 2D and 3D Spatial Data; Michigan State University; University of Notre Dame.
- 1991: University of Washington; Washington State University; Boeing Commercial Airplane Group; University of California at Santa Cruz; Oregon State University.
- 1990: University of Notre Dame; Old Dominion University; University of Missouri at Rolla; IBM T.J. Watson Research Center.

Research Interests

Computer vision, biometrics applications, geometric modeling, computer graphics and scientific visualization, signal and image processing, pattern recognition.

Teaching Interests

Computer vision, pattern recognition, computer graphics and animation, signal and image processing, computer architecture, networking, artificial intelligence, algorithms.

Courses Taught

Legend: ‘U’ indicates an undergraduate course, ‘G’ a graduate-level course.

- 2009-2010: Computer Vision/Biometrics (U/G).
- 2008-2009: Programming Paradigms (U).
- 2007-2008: Programming Paradigms (U), Advanced Pattern Recognition (G).
- 2006-2007: Introduction to Engineering Systems (U), Fundamentals of Computing II (U).
- 2005-2006: computer graphics (U/G), Fundamentals of Computing II (U).
- 2004-2005: computer graphics (U/G).
- 2003-2004: 3D photography (G), logic design (U), research capstone design (U).
- 2002-2003: artificial intelligence (U/G), computer graphics (U/G), digital multimedia hub system design (U).
- 2001-2002: computer vision (G), logic design (U).

- 2000-2001: introduction to digital logic (U).
- 1999-2000: digital design (U), image and video compression (G), introduction to digital logic (U).
- 1998-1999: digital design (U), image processing (G).
- 1997-1998: computer animation (U), knowledge discovery/data mining (G), image processing (U).
- 1996-1997: communication systems (U), computer animation (U), Java programming (U).
- 1995-1996: computer animation (U), computer vision (G).
- 1994-1995: computer animation (U), computer networks (U), computers and society (U).
- 1993-1994: computer vision (G), computer animation (U), statistical pattern recognition (G).
- 1992-1993: computer vision (G), computer animation (U), algorithms (U).
- 1991-1992: computer graphics (U and G).
- 1990-1991: computer architecture (G), systems programming (U), computer graphics (U).

Service

National and International Professional Activities

- Vice President-Finance, IEEE Biometrics Council, 2008-2009.
- Associate Editor, *IEEE Transactions on Image Processing*, 2009-.
- Associate Editor, *IEEE Transactions on Information Forensics and Security*, 2009-.
- Member, Facial Identification Scientific Working Group (chartered by FBI), 2009-.
- Member, NDIA Industrial Committee on Biometrics, 2008-.
- Member, Computing Accreditation Commission, ABET, 2006-2007.
- Associate Editor, *Pattern Recognition Letters*, 2004-2006.
- Constitution and Bylaws committee, International Association for Pattern Recognition, 2008-.
- Chair, Education Committee, International Association for Pattern Recognition (IAPR), 2002-2004. Member, 2006-2008.
- Associate Editor-In-Chief, *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 1999-2000.
- Associate Editor, *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 1995-1998.
- Member, computer systems support review panel, College of Engineering, Michigan State University, 2000.
- Member, Board of Visitors/Strategic Partners Council, Department of Computer Science and Engineering, Michigan State University, 1998-.
- Program Evaluator, Computing Accreditation Commission, ABET (*nee* Computer Science Accreditation Commission, Computing Sciences Accreditation Board), 1995-2007.

- Associate Editor, *Pattern Recognition*, 1994-1998.
- Conference-Related Activities
 - Track Program co-Chair (Biometrics), ICPR 2010, Istanbul.
 - Publications co-Chair, CVPR 2009, Miami.
 - Computer Chair, CVPR 2008, Anchorage.
 - Publications Chair: BTAS 2008, 2009, Washington.
 - Publications Chair, ICPR 2008, Tampa, Florida.
 - Program co-Chair, BTAS 2007, Washington DC.
 - Tutorials Chair, IAPR-ICB 2007, Seoul.
 - Publications Chair, CVPR 2007, Minneapolis.
 - General co-Chair (with Sharath Pankanti), Conference on Biometric Techniques for Human Identification, SPIE, 2006, Orlando.
 - Publications Chair, 2003 IEEE Computer Society Conference on Computer Vision and Pattern Recognition (Madison, Wisconsin).
 - Publications Chair, 2001 IEEE Computer Society Conference on Computer Vision and Pattern Recognition (Kauai).
 - Media Chair, 1999 IEEE Computer Society Conference on Computer Vision and Pattern Recognition (Colorado Springs).
 - Workshops Chair, 1998 IEEE Computer Society Conference on Computer Vision and Pattern Recognition (Santa Barbara).
 - Program Committee memberships:
 - ACCV Workshop on Large-scale 3D Modeling, 2009.
 - IEEE International Conference on Image Processing (ICIP), 2009.
 - IEEE Conf. on 3D Processing, Visualization and Transmission (3DPVT), 2008, 2010.
 - IEEE Computer Society Workshop on Biometrics, 2006, 2008, 2009.
 - IEEE Conf. on Object Tracking and Classification Beyond the Visible Spectrum (OTCBVS) 2009.
 - European Conference on Computer Vision (ECCV 2006).
 - IAPR International Conference on Biometrics (IAPR-ICB 2006, 2009).
 - Int. Conf. on Biometric Authentication (ICBA 2005).
 - SPIE Conference on Biometric Technology for Human Identification (2004, 2005, 2007, 2008, 2009, 2010).
 - Workshop on Audio- and Video-Based Biometric Person Authentication (AVBPA 2003, 2005)
 - Biometrics Consortium Research Symposium (2003, 2004)
 - Biometric Authentication Workshop 2004 (Prague)
 - Int. Conference on Pattern Recognition: 2006, 2004, 2002, 1994.
 - IEEE Computer Society Conference on Computer Vision and Pattern Recognition (CVPR): 2006, 2005, 2004, 2002, 2001, 2000, 1999, 1998, 1994, 1992.
 - Conf. on 3D Digital Imaging and Modeling (3DIM): 2009, 2007, 2005, 2003, 2001, 1999, 1997.
 - Int. Symp. on Computer Vision: 1995.

- Vision Interface 1995.
- IEEE Workshop on CAD-Based Computer Vision, 1994
- SPIE Conference on Applications of AI: Machine Vision and Robotics, 1993.
 - Tutorial presenter, 1993 IEEE Computer Society Conference on Computer Vision and Pattern Recognition (New York City).
 - Tutorial Presenter, 1994 IEEE Computer Society Conference on Computer Vision and Pattern Recognition (Seattle).
- Co-Guest Editor (with Jonathon Phillips and Adam Hoover), *Computer Vision and Image Understanding*, special issue on Empirical Evaluation Methods in Computer Vision, October 2001.
- Co-Guest Editor (with George Stockman and Octavia Camps), *Computer Vision and Image Understanding*, special issue on CAD-Based Computer Vision, March 1998.
- Co-Guest Editor (with Katsushi Ikeuchi), *Computer Vision, Graphics, and Image Processing: Image Understanding*, special issue on CAD-Based Computer Vision, 1995.
- Invited participant, Second EEC-US Workshop on Invariance in Computer Vision, Ponta Delgada, Azores, October 1993.
- Invited participant and panel chair, NSF Workshop on ‘Challenges in Computer Vision: Future Research Directions,’ Maui, June 1991.
- Session organizer and chair, IEEE International Conference on Systems, Man, and Cybernetics, Cambridge, November 1989.
- Invited participant, NSF Range Image Processing Workshop, East Lansing, Michigan, May 1988.
- Fellow: IAPR.
- Senior Member: IEEE.
- Senior Member: ACM.
- Member: American Society for Engineering Education.
- Proposal reviewing activity: National Science Foundation, National Science and Engineering Research Council (Canada), Australian Research Council, Israel Science Foundation.
- Manuscript reviewing activity: *IEEE Transactions on Pattern Analysis and Machine Intelligence*; *IEEE Transactions on Information Forensics and Security*; *IEEE Transactions on Neural Networks*; *IEEE Transactions on Image Processing*; *IEEE Transactions on Robotics and Automation*; *IEEE Transactions on Systems, Man, and Cybernetics*; *IEEE Transactions on Knowledge and Data Engineering*; *IEEE Transactions on Geoscience and Remote Sensing*; *IEEE Transactions on Ultrasonics, Ferroelectrics, and Frequency Control*; *IEEE Signal Processing Letters*; *IEEE Robotics and Automation Magazine*, *Computer Vision and Image Understanding* (aka CVGIP, *CVGIP: Image Understanding*), *International Journal of Computer Vision*, *International Journal of Pattern Recognition and Artificial Intelligence*, *Pattern Recognition Letters*, *Pattern Recognition*, *Machine Vision and Applications*, *IEE Proceedings: Vision, Image, and Signal Processing*, *Image and Vision Computing*, *The Computer Journal*,

Electronics Letters, Communications of the ACM, ACM Computing Surveys, and dozens of computer vision conferences and workshops.

Department-level Service

- University of Notre Dame
 - Graduate Studies committee, 2001-2003.
 - Faculty Search committee, 2001- (chair, 2002-2003, 2006-2007).
 - Committee on Appointments and Promotions, 2002-.
 - Curriculum Committee, 2002-2006, 2008- (chair, 2002-2006, 2008-).
 - Assessment Committee, 2006- (chair, 2006-2007).
- Ohio State University
 - Computer Engineering area committee: 1998-2001 (chair, 1999-2001).
 - Computer Engineering faculty search chair, 1999-2001.
 - Computing facilities committee, 1999- 2001 (chair, 2000-2001).
 - Curriculum committee, 1999-2001.
 - Alumni society faculty representative, 1999.
 - Industrial fellowship committee, 1999.
 - Graduate recruiting and financial aid subcommittee, 1998-1999.
- Washington State University
 - Associate Director (associate chair) for Computer Science, School of EECS, 1997-1998.
 - Computer Science Undergraduate Coordinator, 1994-97.
 - Computer Science Curriculum Committee, 1992-1998 (chair, 1992-93, 1997-1998).
 - Computer Engineering Curriculum Committee, 1995-1998.
 - Computer Science Faculty Recruiting Committee, 1991-93, 1996-98 (chair, 1997-1998).
 - EECS Promotion and Tenure Committee, 1996-98 (chair, 1997-1998).
 - EECS Graduate Studies Committee, 1991-93.

University-level Service

- University of Notre Dame
 - Chief Advisor, Tau Beta Pi student chapter, 2008-.
 - University Committee on Academic Technologies, 2007-.
 - *Ad hoc* Committee on Design Curricula, 2008.
 - College Computing Committee, 2007-. Chair, 2008-.
 - College Council, College of Engineering, 2006-.
 - Engineering South/Engineering Learning Center Design Committee, 2006.
 - University Committee on Elections, 2005-2006.
 - Advisory Committee to the Provost on the Evaluation of Teaching (Faculty Senate representative), 2005-2008.
 - College of Engineering Honors Curriculum committee, 2004-2005.
 - Dean of Engineering Review Committee, College of Engineering, 2002-2003.
 - *Ad hoc* space planning committee, College of Engineering, 2002.

- Faculty Senate, 2002-2006. Administrative Affairs subcommittee, 2002-2006.
- College of Engineering Undergraduate Studies Committee, 2002-2006.
- Science Learning Center Visualization Facility design group, 2001-2002.
- Cognitive Science *ad hoc* planning group, 2001-2002.
- Ohio State University
 - OSU 'Roads Scholar', 1999
 - Faculty Phonathon (undergraduate recruiting), 1999-2000.
- Washington State University
 - General Education Committee, 1997-1998. Computer Literacy Subcommittee, 1996-1998.
 - New Student Orientation academic advising, 1996-1998.
 - 'Student Access to Computers' Committee, 1997.
 - Four-Year Degree Program Advisory Board, 1997-1998.
 - New Student Orientation Planning Group, 1997.
 - President's Academic Steering Committee for Computing and Telecommunications, 1996-1998.
 - Faculty Phonathon (undergraduate recruiting), 1992-1998.
 - Graduate School internal review committee for M.S. program in Architecture, 1993-1994, 1996.
 - Provost's Virtual University task force, 1995.
 - Steering Committee, workshops on teaching and learning with technology, 1995.

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