

JOSEPH J. LAVIOLA JR.
Curriculum Vitae

University of Central Florida
School of Electrical Engineering and Computer Science
Orlando, FL 32816-2362
(407) 882-2285
jjl@cs.ucf.edu
<http://www.eecs.ucf.edu/~jjl/>

RESEARCH INTERESTS

User interfaces, interactive 2D and 3D graphics, motion tracking and estimation, pattern recognition

EDUCATION

- 2005:** **Ph.D.**, Computer Science, Brown University
Dissertation: "Mathematical Sketching: A New Approach to Creating and Exploring Dynamic Illustrations"
Advisor: Andries van Dam
- 2001:** **Sc.M.**, Applied Mathematics, Brown University
- 2000:** **Sc.M.**, Computer Science, Brown University
Thesis: "Whole-Hand and Speech Input in Virtual Environments"
- 1996:** **B.S.**, Computer Science, Florida Atlantic University

PROFESSIONAL EXPERIENCE

- 2008-Present:** Affiliated Research Faculty, Institute for Simulation and Training, University of Central Florida, Orlando, FL
- 2007-Present:** Assistant Professor, University of Central Florida, Orlando, FL
- 2006-Present:** Adjunct Assistant Professor of Computer Science (Research), Brown University, Providence, RI
- 2005-2006:** Postdoctoral Research Associate, Brown University, Providence, RI
Continuing work in mathematical sketching as well as exploring how different orientation tracking algorithms work in augmented reality environments.
- 2000-Present:** Consultant, JJI Interface Consultants, Inc., Oviedo, FL
Consulting services for user interface problems including web site design and development. My consultancies include Nextron Medical Technologies, Physion, Inc., Bellissima Cosmetics and Rosebud LMS, Inc.

- 1998-2005:** Research Assistant, Brown University Computer Graphics Lab, Providence, RI
- Developed mathematical sketching, an approach to making dynamic illustrations through the combination of handwritten mathematics and free-form drawings and created a mathematical expression recognition system. Studied how different factors such as motion style, sampling rate, prediction time, and noise variance affected various prediction algorithms for human motion tracking in virtual environments. Explored how multimodal interfaces could be used in virtual environments as well as the general topic of improving 3D interfaces in virtual environments. Assisted in the startup and development of the Brown University Technology Center for Advanced Scientific Computing and Visualization.*
- 1999:** Teaching Assistant, Brown University, CS-295-5, Interdisciplinary Scientific Visualization
- Maintained course web page, prepared class notes, graded homework.*
- 1997:** Research Scientist, Fraunhofer Center for Research in Computer Graphics, Providence, RI
- Developed demonstration applications for a table-based virtual environment display system utilizing 2D and 3D gesture-based interface techniques.*
- 1996:** Software Technician, UCS, Inc., Fort Lauderdale, FL
- Performed software test automation and software quality assurance.*
- 1995:** Student Intern, IBM, Boca Raton FL
- Maintained SQL database query system and performed website development tasks.*

HONORS AND AWARDS

- 2008:** Best Paper Award, 9th International Symposium on Smart Graphics
- 2007:** UCF Presidential Major Equipment Award
- 2006:** Best Paper Award, Eurographics Workshop on Sketch-Based Interfaces and Modeling
- 2004:** Best Paper Presentation (Applied Estimation Session), 2004 American Control Conference
- 2000-2002, 2004:** The van Dam Fellowship
- 1998:** IBM Cooperative Fellowship
- 1996:** FAU's Aaron Finerman Award
- 1996:** FAU's Faculty Award for Outstanding Undergraduate Achievement
- 1995:** Microsoft Senior Achievement Award

Also elected to Sigma Xi (1998), Phi Kappa Phi (1995), and Phi Eta Sigma (1993)

RESEARCH CONTACTS AND GRANTS

Total as PI: \$323,651

Total as Co-PI: \$30,000

Total Funding at UCF: \$323,651

“Deep Green Program Support”, Science Applications International Corporation Award 4400157271, \$67,229, Sole PI (100% credit), June 2008 – June 2009.

“Deep Green Program Support”, UCF/I-4 Match, \$33,614, Sole PI (100% credit), July 2008 – June 2009.

“Interaction and the Analyst Workstation of the Future”, US Air Force Research Lab Award FA87500820202, \$70,000, Sole PI (100% credit), June 2008 – June 2009.

“Sketching Mathematical Algorithms”, US Air Force Research Lab A-SpaceX Award FA8750-08-C-0131, Sole PI (100% credit) on Subcontract from Brown University, \$53,078 of \$250,000, Feb. 2008 – Feb. 2009.

“Pre-Visualization of Content Creation and User Experience for Free-Choice Learning Venues”, UCF Presidential Major Equipment Award, \$47,574, Sole PI (50% credit), Dec. 2007 – Nov. 2008.

“Sketching Mathematical Algorithms”, Disruptive Technology Office A-SpaceX Award N61339-06-C-0186, Sole PI (100% credit) on Subcontract from Brown University, \$75,943 of \$350,000, Sept. 2006 – Dec. 2007.

“Adaptive Real-Time Learning for Mathematical Expression Recognition in Mathematical Sketching”, NSF STTR Phase I Award OII-0611012, \$132,000, Co-PI (23% credit), PI: Donald P. Carney, July 2006 – June 2007.

PUBLICATIONS

Total Citations (according to Google Scholar): 1023

Book and Book Chapters

To Appear

LaViola, J., Prabhat, Forsberg, A., Laidlaw, D., and van Dam, A. “Virtual Reality-Based Interactive Scientific Visualization Environments”. To Appear in *Interactive Visualization: A State-of-the-Art Survey*. Springer Verlag, 2008.

In Print

Bowman, D., Kruijff, E., LaViola, J., and Poupyrev, I. *3D User Interfaces: Theory and Practice*, Addison Wesley, July 2004. (cited 216 times, source: [Google Scholar](#))

Journals and Periodicals

In Print

LaViola, J. “Bringing VR and Spatial 3D Interaction to the Masses through Video Games”, *IEEE Computer Graphics and Applications*, 28(5):10-15, September/October 2008.

LaViola, J., and Zeleznik, R. “A Practical Approach to Writer-Dependent Symbol Recognition Using a Writer-Independent Recognizer”, *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 29(11):1917-1926, November 2007.

LaViola, J. “An Initial Evaluation of MathPad²: A Tool for Creating Dynamic Mathematical Illustrations”, *Computers and Graphics*, 31(4):540-553, August 2007.

Julier, S., and LaViola, J. “On Kalman Filtering with Nonlinear Equality Constraints”, *IEEE Transactions on Signal Processing*, 55(6):2774-2784, June 2007.

LaViola, J. “Advances in Mathematical Sketching: Moving Toward the Paradigm’s Full Potential”, *IEEE Computer Graphics and Applications*, 27(1):38-48, January/February 2007.

Katzourin, M., Ignatoff, D., Quirk, L., LaViola, J., and Jenkins, O. “SwordPlay: Innovating Game Development through VR”, *IEEE Computer Graphics and Applications*, 26(6):15-19, November/December 2006.

LaViola, J. and Zeleznik, R. “MathPad²: A System for the Creation and Exploration of Mathematical Sketches”, *ACM Transactions on Graphics (Proceedings of SIGGRAPH 2004)*, 23(3):432-440, August 2004.

Bowman, D., Kruijff, E., LaViola, J., and Poupyrev, I. “An Introduction to 3-D User Interface Design”, *PRESENCE: Teleoperators and Virtual Environments*, 10(1):96-108, February 2001. (cited 114 times, source: [Google Scholar](#))

Van Dam, A., Forsberg, A. Laidlaw, D., LaViola, J., and Simpson, R. “Immersive VR for Scientific Visualization: A Progress Report”, *IEEE Computer Graphics and Applications*, 20(6):26-52, November/December 2000. (cited 100 times, source: [Google Scholar](#))

LaViola, J. “A Discussion of Cybersickness in Virtual Environments”, *SIGCHI Bulletin* 32(1):47-56, January 2000.

Forsberg, A., LaViola, J., Markosian, L., and Zeleznik, R. “Seamless Interaction in Virtual Reality”, *IEEE Computer Graphics and Applications*, 17(6):6-9, November/December 1997.

Refereed Conferences and Workshops

In Print

Zeleznik, R., Miller, T., Li, C., and LaViola, J. “MathPaper: Mathematical Sketching with Fluid Support for Interactive Computation”, *Lecture Notes in Computer Science 5166, 9th International Symposium on Smart Graphics (SG 2008)*, 20-32, August 2008. (Best Paper Award)

Forsberg, A., Bragdon, A., LaViola, J., Raghupathy, S., and Zeleznik, R. "An Empirical Study in Pen-Centric User Interfaces: Diagramming", *Proceedings of the Eurographics Workshop on Sketch-Based Interfaces and Modeling 2008*, 135-142, June 2008.

Li, C., Miller, T., Zeleznik, R., and LaViola, J. "AlgoSketch: Algorithm Sketching and Interactive Computation", *Proceedings of the Eurographics Workshop on Sketch-Based Interfaces and Modeling 2008*, 175-182, June 2008.

LaViola, J., Forsberg, A., Huffman, J., and Bragdon, A. "The Influence of Head Tracking and Stereo on User Performance with Non-Isomorphic 3D Rotation", *Proceedings of the 14th Eurographics Symposium on Virtual Environments*, 111-118, May 2008.

LaViola, J., Leal, A., Miller, T., and Zeleznik, R. "Evaluation of Techniques for Visualizing Mathematical Expression Recognition Results", *Proceedings of Graphics Interface 2008*, 131-138, May 2008.

LaViola, J., Forsberg, A., Huffman, J., and Bragdon, A. "Effects of Stereo and Head Tracking on Non-Isomorphic 3D Rotation", *IEEE Symposium on 3D User Interfaces 2008*, 155-156, March 2008.

Lemmerman, D. and LaViola J. "An Exploration of Interaction-Display Offset in Surround Screen Virtual Environments", *Proceedings of the IEEE Symposium on 3D User Interfaces 2007*, 9-15, March 2007.

LaViola, J. and Katzourin, M. "An Exploration of Non-Isomorphic 3D Rotation in Surround Screen Virtual Environments", *Proceedings of the IEEE Symposium on 3D User Interfaces 2007*, 49-54, March 2007.

Lemmerman, D. and LaViola J. "Effects of Interaction-Display Offset on User Performance in Surround Screen Virtual Environments", *Proceedings of IEEE Virtual Reality 2007*, 303-304, March 2007.

LaViola, J. "An Initial Evaluation of a Pen-Based Tool for Creating Dynamic Mathematical Illustrations", *Proceedings of the Eurographics Workshop on Sketch-Based Interfaces and Modeling 2006*, 157-164, September 2006. (Best Paper Award)

Julier, S. and LaViola, J. "An Empirical Study into the Robustness of Split Covariance Addition (SCA) for Human Motion Tracking", *Proceedings of the 2004 American Control Conference, IEEE Press*, 2190-2195, June 2004.

LaViola, J., Keefe, D., Acevedo, D., and Zeleznik, R. "Case Studies in Building Custom Input Devices for Virtual Environment Interaction", *Proceedings of the IEEE VR 2004 Workshop on Beyond Wand and Glove-Based Interaction*, 67-71, March 2004.

LaViola, J. "A Comparison of Unscented and Extended Kalman Filtering for Estimating Quaternion Motion", *Proceedings of the 2003 American Control Conference, IEEE Press*, 2435-2440, June 2003.

LaViola, J. "A Testbed for Studying and Choosing Predictive Tracking Algorithms in Virtual Environments", *Proceedings of Immersive Projection Technology and Virtual Environments 2003*, ACM Press, 189-198, May 2003.

LaViola, J. "Double Exponential Smoothing: An Alternative to Kalman Filter-Based Predictive Tracking", *Proceedings of Immersive Projection Technology and Virtual Environments 2003*, ACM Press, 199-206, May 2003.

LaViola, J. "An Experiment Comparing Double Exponential Smoothing and Kalman Filter-Based Predictive Tracking Algorithms", *Proceedings of IEEE Virtual Reality 2003*, 283-284, March 2003.

Zelevnik, R., LaViola, J., Acevedo, D., and Keefe, D. "Pop Through Button Devices for VE Navigation and Interaction", *Proceedings of IEEE Virtual Reality 2002*, 127-134, March 2002.

LaViola, J., Zelevnik, R., Acevedo, D., and Keefe, D. "Hands-Free Multi-Scale Navigation in Virtual Environments", *Proceedings of the 2001 Symposium on Interactive 3D Graphics*, 9-15, March 2001.

Keefe, D., Acevedo, D., Moscovich, T., Laidlaw, D., and LaViola, J. "CavePainting: A Fully Immersive 3D Artistic Medium and Interactive Experience", *Proceedings of the 2001 Symposium on Interactive 3D Graphics*, 85-93, March 2001.

LaViola, J. "MSVT: A Virtual Reality-Based Multimodal Scientific Visualization Tool", *Proceedings of the Third IASTED International Conference on Computer Graphics and Imaging*, 1-7, November 2000.

LaViola, J. and Zelevnik, R. "Flex and Pinch: A Case Study of Whole Hand Input Design for Virtual Environment Interaction", *Proceedings of the Second IASTED International Conference on Computer Graphics and Imaging*, 221-225, October 1999.

LaViola, J. "A Multimodal Interface Framework For Using Hand Gestures and Speech in Virtual Environment Applications", *Lecture Notes in Artificial Intelligence #1739, Gesture-Based Communication in Human-Computer Interaction*, 303-314, March 1999.

LaViola, J., Holden, L., Forsberg, A., Bhuphaibool, D., and Zelevnik, R. "Collaborative Conceptual Modeling Using the SKETCH Framework", *Proceedings of the First IASTED International Conference on Computer Graphics and Imaging*, 154-158, June 1998.

Forsberg, A., LaViola, J., and Zelevnik, R. "ErgoDesk: A Framework for Two- and Three-Dimensional Interaction at the ActiveDesk", *Proceedings of the Second International Immersive Projection Technology Workshop*, Ames, Iowa, May 11-12, 1998.

LaViola, J., Barton, R., Goettsch, A., and Cross, R. "A Real-Time Distributed Virtual Environment for Collaborative Engineering", *Proceedings of Computer Applications in Production and Engineering (CAPE)*, 712-726, November 1997.

Panels

In Print

LaViola, J., Bowman, D., Ellis, S., Interrante, V., Lok, B., and Swan, J. “User Studies in VR: What Can We Learn From Them and What Are They Good For?”, *IEEE Virtual Reality 2008*, 303-304, March 2008. (Organizer and Panelist)

Courses and Tutorials

In Print

Kruijff, E., Bowman, D., LaViola, J., and Poupyrev, I. “3D User Interfaces: From Lab to Living Room”, Course #17, Presented at ACM CHI 2008, Florence, Italy, April 2008.

LaViola, J., Igarashi, I., Alvarado, C., and Lipson, H. “Sketch-Based Interfaces: Techniques and Applications”, Course #3, Presented at ACM SIGGRAPH 2007, San Diego, California, August 2007.

LaViola, J., Davis, R., and Igarashi, I. “An Introduction to Sketch-Based Interfaces”, Course #18, Presented at ACM SIGGRAPH 2006, Boston, Massachusetts, July 2006.

Bowman, D., LaViola, J., Mine, M., and Poupyrev, I. “Advanced Topics in 3D User Interface Design”, Course #44, Presented at ACM SIGGRAPH 2001, Los Angeles, California, August 2001.

Bowman, D., Kruijff, E., LaViola, J., Mine, M., and Poupyrev, I. “3D User Interface Design: Fundamental Techniques, Theory, and Practice”, Course #36, Presented at ACM SIGGRAPH 2000, New Orleans, Louisiana, July 2000.

Bowman, D., Kruijff, E., LaViola, J., and Poupyrev, I. “The Art and Science of 3D Interaction”, Full-day tutorial presented at IEEE Virtual Reality 2000, New Brunswick, New Jersey, March 2000.

Bowman, D., Kruijff, E., LaViola, J., Mine, M., and Poupyrev, I. “The Art and Science of 3D Interaction”, Full-day tutorial presented at the ACM Symposium on Virtual Reality Software and Technology, London, England, December 1999.

Bowman, D., Kruijff, E., LaViola, J., and Poupyrev, I. “The Art and Science of 3D Interaction”, Full-day tutorial presented at IEEE Virtual Reality '99, Houston, Texas, March 1999.

Other Publications

Reiter, J., Kirby, R. M., and LaViola, J. “Immersive Hierarchical Visualization and Steering for Spectral/hp Element Methods”, Technical Report CS-01-03, Brown University, Department of Computer Science, Providence RI, May 2001.

LaViola, J. “A Survey of Hand Posture and Gesture Recognition Techniques and Technology”, Technical Report CS-99-11, Brown University, Department of Computer Science, Providence RI, June 1999.

Pickering, J., Bhuphaibool, D., LaViola, J., and Pollard, N. "The Coach's Playbook", Technical Report CS-99-08, Brown University, Department of Computer Science, Providence RI, May 1999.

Forsberg, A., LaViola, J., and Zeleznik, R. "Incorporating Speech Input into Gesture-Based Graphics Applications at The Brown University Graphics Lab", CHI'99 Workshop on Designing the User Interface for Pen and Speech Multimedia Applications, May 1999.

LaViola, J., Forsberg, A., and Zeleznik, R. "Jot: A Framework for Interface Research", IBM's interVisions Online Magazine, Issue #11, February 1998.

LaViola, J. "Analysis of Mouse Movement Time Based on Varying Control to Display Ratios Using Fitts' Law", Technical Report CS-97-17, Brown University, Department of Computer Science, Providence RI, October 1997.

LaViola, J. "Experiment in VM Reduction, Conversion of Site Operating Procedures to the World Wide Web", IBM Technical Report, TR54.922, December 29, 1995.

STUDENTS

PhD

Paul Varcholik, started in Fall 2007

Ross Byers, started in Spring 2008

Diane Marinkas, started in Spring 2008

Masters:

Jared Bott, started Spring 2008, expected to finish Fall 2008

Undergraduate

Anamary Leal, started in Summer 2007, Honors in the Major, expected to finish Fall 2008

TEACHING AND ADVISING

CAP6938: Topics in Pen-Based User Interfaces, School of EECS, UCF (Fall 2008)

CAP6938: 3D User Interfaces for Games and Virtual Reality, School of EECS, UCF (Spring 2008)

CAP5937/6938: Topics in Pen-Based User Interfaces, School of EECS, UCF (Fall 2007)

COP3502H: Honors Computer Science I, School of EECS, UCF (Spring 2007)

CS193-33: Independent Study with Michael Katzourin, Department of Computer Science, Brown University (Fall 2006)

INVITED TALKS

"Spatial 3D Interaction and Video Games"

- Electronic Arts, Maitland, FL (August 2008)

“Research at the Interactive Systems and User Experience Lab”

- The Burnett Honors College, Orlando, FL (July 2008)

“Mathematics, Physics, and Chemistry: Tablet PC Research and Education”

- Modeling, Simulation, and Training techCAMP, Orlando, FL (January 2008)
- Modeling, Simulation, and Training techCAMP, Orlando, FL (November 2007)

“Mathematics, Physics, and Chemistry: Tablet PC Research and Education at Brown University”

- Pace University, NY, NY (April 2006)

“Mathematical Sketching: A New Approach for Creating and Exploring Dynamic Illustrations”

- Workshop on Computer Graphics: Current Trends in Research and Industry, Lahore University of Management Science, Pakistan (July 2007)
- SUNY Stony Brook, Stony Brook, NY (March 2006)
- Lehigh University, Bethlehem, PA (March 2006)
- University of Central Florida, Orlando, FL (March 2006)
- Aptima, Woburn, MA (September 2005)
- Wolfram Research, Champaign, IL (May 2005)
- Microsoft Research, Seattle, WA (February 2005)
- IBM Thomas J. Watson Research Center, Hawthorne, NY (December 2004)

SERVICE TO THE PROFESSION

Panels Chair: IEEE Virtual Reality 2006

Publications Chair: IEEE Virtual Reality 2007, 2008

Program Committees: Intelligent User Interfaces (2009)

Eurographics Short Papers Program (2008)

IEEE Symposium on 3D User Interfaces (2007-2008)

IEEE Virtual Reality (2007-2008),

Eurographics Workshop on Sketch-Based Interfaces and Modeling (2007-2008)

6th IEEE International Symposium on Mixed and Augmented Reality (2007)

2nd International Symposium on Visual Computing (2006)

Journal Reviewer: *International Journal of Human Computer Studies* (2008)

Pattern Recognition (2007)

Computers and Graphics (2001, 2006, 2007, 2008)

IEEE Transactions on Pattern Analysis and Machine Intelligence (2007)

IEEE Computer Graphics and Applications (2002-2003, 2005-2006, 2008)

Computer Animation & Virtual Worlds (2006)

IEEE Transactions on Visualization and Computer Graphics (2005, 2006)
IEEE Transactions on Robotics (2005)
Virtual Reality (2005)
Pattern Recognition Letters (2005)

External Conference Reviewer: ACM SIGGRAPH Sketches and Poster's Juror (2007)
Graphics Interface (2005, 2007)
Eurographics Workshop on Virtual Environments (2002, 2004, 2007)
ACM User Interface Software and Technology (2003, 2005, 2006, 2008)
ACM CHI (2005-2006)
ACM Virtual Reality Software and Technology (2005)
IEEE Virtual Reality (2005)
IEEE Visualization (2004)
ACM SIGGRAPH (2004, 2008)
12th IEEE Mediterranean Conference on Control and Automation (2004)
IEEE and ACM International Symposium on Mixed and Augmented Reality (2003, 2008)
ACM Symposium on Interactive 3D Graphics (2003)
ACM SIGGRAPH courses (1999)

SERVICE TO UCF

Member, Industrial Advisory Committee, EECS, 2007.

EXTRACURRICULAR ACTIVITIES

Manager and Player of Computer Science Department intramural football and softball teams (1998-2006), Assistant Varsity Baseball Coach at Olympic Heights High School, Boca Raton, FL (1993-1994), Assistant Baseball Coach at American Legion Post 164, Boynton Beach, FL (1993). Hobbies include sports, computer games, and film

REFERENCES

Andries van Dam

Thomas J. Watson, Jr., University Professor of Technology and Education
and Professor of Computer Science
Brown University
Department of Computer Science, Box 1910
Providence, RI 02912
Phone: 1-401-863-7640
Email: avd@cs.brown.edu

John F. Hughes

Associate Professor of Computer Science
Brown University
Department of Computer Science, Box 1910
Providence, RI 02912
Phone: 1-401-863-7638
Email: jfh@cs.brown.edu

David H. Laidlaw

Associate Professor of Computer Science
Brown University
Department of Computer Science, Box 1910
Providence, RI 02912
Phone: 1-401-863-7647
Email: dhl@cs.brown.edu

Doug A. Bowman

Associate Professor
Virginia Tech
Department of Computer Science
660 McBryde Hall
Blacksburg, VA 24061
Phone: 1-540-231-2058
Email: bowman@vt.edu

Issa Batarseh

Professor and Director EECS
School of Electrical Engineering and Computer Science
University of Central Florida
Orlando, FL 32816-2362
Phone: 1-407-823-0185
Email: batarseh@eecs.ucf.edu

Michael Macedonia

Director, National Security Division
Forterra Systems Inc.
University Corporate Center I
3501 Quadrangle Blvd, Suite 355
Orlando, FL 32817

Phone: 1-407-515-3460

Email: macedonia@computer.org