

# Curriculum Vitae

Hughes, Charles E.

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**Pegasus Professor, Department of Electrical Engineering & Computer Science  
Contributing Faculty, Institute for Simulation & Training  
Director, Synthetic Reality Laboratory: <http://sreal.ucf.edu/>  
University of Central Florida**

Orlando, FL 32816-2362

E-mail: [ceh@cs.ucf.edu](mailto:ceh@cs.ucf.edu)

Home Page: <http://www.eecs.ucf.edu/~ceh/>

Member of Graphics Group: <http://www.cs.ucf.edu/graphics>  
& Computational Imaging Lab: <http://cil.cs.ucf.edu>

## Education:

Ph.D. (Computer Science) December 1970; Penn State Univ., University Park, PA  
M. S. (Computer Science) December 1968; Penn State Univ., University Park, PA  
B.A. (Mathematics) June 1966; Northeastern Univ., Boston, MA

## Academic Experience:

1980-Present: Professor, Electrical Engineering and Computer Science, University of Central Florida  
1982-Present: Contributing Faculty, Institute for Simulation & Training  
2010-Present: Director, Synthetic Reality Laboratory  
2007-Present: UCF Pegasus Professor  
2006-2010: Director, Media Convergence Laboratory  
2007-2008: Associate Director, School of EECS  
2007-Present: Cognitive Sciences Faculty and Steering Committee  
2005-Present: Professor, Digital Media  
2001-2009: Affiliate Faculty, Text & Technology PhD Program  
1974-1980: Assoc. Professor (1974-78); Professor (1978-80) of Computer Science, Univ. of Tennessee  
1972-1974: Assistant Professor of Computer Science, Pennsylvania State Univ.  
1968-1971: Instructor of Computer Science, Pennsylvania State Univ.  
1967-1968: Research Assistant, Computer Science, Pennsylvania State Univ.

## Industrial/Government Experience:

1971-1972: Postdoctoral Research Associate – National Research Council/NBS, Washington, D.C.  
1966-1968: Computer Programmer – Applied Research Lab., State College, PA  
1962-1966: Computer Programmer – Radio Corp. of America, Burlington, MA

## Current Research Interests:

Computer Graphics, Digital Cultural Heritage, Digital Puppetry, Human-Technology Interaction, Mixed and Virtual Reality, Real-Time Matting, Theory of Computation  
Research Incentive Awards: 2007, 1995 (PEP award)

## Teaching Interests:

Computational Complexity, Parallel & Distributed Processing, Algorithm Design & Analysis, Compiler Construction  
Teaching Incentive Awards: 2009, 2002, 1995  
College Award for Excellence in Undergraduate Teaching: 2001, 1992  
University Award for Excellence in Undergraduate Teaching: 2001

## Current Projects:

### Digital Puppetry

#### Basic Research

Agent behaviors, human computer interaction and network protocols

#### Applications

Training, rehabilitation and peer pressure resist/avoid skills

#### Funding:

NIH: Use of role-playing in virtual environments to help middle school girls to develop resist/avoid strategies to peer pressure with regard to risky behaviors

NSF: Support for network protocol development with an emphasis on reducing latency and bandwidth requirements

NSF: Use of role-playing in virtual environments to help college freshmen to develop resist/avoid strategies to peer pressure with regards to binge drinking

Gates: *TeachLive* project that uses digital puppetry in teacher rehearsal/training

Auxiliary: UCF has established an Auxiliary for support of the TeachLive system's use; fees from universities that use the system keep this auxiliary funded

#### Collaborations (in addition to those in CECS and IST):

NIH grant involves colleagues in UCF Colleges of Nursing and Science, Penn State and Miami

Second NSF grant is joint with Weill Cornell Medical College and involves a colleague from UCF Student Development & Enrollment Services

Gates Foundation grant involves colleagues in UCF College of Education and from ten (soon to grow to thirty) colleges of education at other universities

#### Recognition in 2011/12:

*TeachLive* Selected by American Association of Colleges of Teacher Education for 2011 Best Practice Award for Innovations in Technology

### Augmented Reality

#### Basic Research

Computational imaging, computer graphics and human computer interaction

#### Applications

Digital heritage, training, rehabilitation and STEM education

#### Funding:

NSF: Virtual and augmented reality for digital heritage and STEM experiences

NSF: Augmented reality to enhance science center ecology exhibits

NSF: Augmented reality to learn concepts in physics through whole body interactions

NEH: Augmented reality enhancements to make connections between visits to Queens Museum of Art and to our virtual recreation of 1964/65 NY World's Fair

ONR: Augmented reality via virtual projections onto human shapes (robots, mannequins)

#### Collaborations (in addition to those in CECS and IST):

NSF and NEH grants involve colleagues in UCF Colleges of Arts & Humanities and Science, at Michigan Tech and from a number of museums and science centers

ONR grant involves colleagues at Naval Postgraduate School and University of North Carolina

#### Recognition in 2011/12:

Our 1964/65 NY World's Fair digital recreation was selected by NSF for presentation at the American Association for the Advancement of Science meeting in DC on February 16-21, 2011

### Other Basic Research

Compression of material reflectance functions to achieve real-time rendering of large numbers of material associated with a single scene

Control of mobile robots in remote environments

Interfaces for multi-touch surfaces

Interactive rendering of complex environments with large number of lighting sources

Real-time matting in noisy environments; natural image matting

Synthesizing agent behaviors from observed human behaviors

**External Research Grants and Contracts (PI underlined):****Active – NEH (1), NSF (5), NIH (1), ONR (1):****Total active \$6,160,806; individual credit of \$2,294,214**

**National Endowment for the Humanities**, *Journey beyond the Fairs*, (PIs: L. Walters, **C. E. Hughes**, D. Hughes), 2011-2013.

**National Science Foundation**, *Reducing Alcohol Use among College Students Using Digital Puppetry*, (PIs: **C. E. Hughes**, Tom Hall), joint with Weill Cornell College of Medicine, 2011-2014.

**National Science Foundation**, *Metaphor-Based Learning of Physics Concepts through Whole-Body Interaction in a Mixed Reality Science Center Exhibit*, (PIs: R. Lindgren, J. M. Moshell, **C. E. Hughes**, E. Smith, S. Gallagher), 2011-2014.

**National Science Foundation**, *Interconnections: Revisiting the Future*, (PIs: L. Walters, **C. E. Hughes**, D. Hughes, J. M. Moshell, S. Fiore, M. Adams, D. Mapes, E. Smith), 2009-2013.

**National Science Foundation**, *EAGER: Efficient control and transmission of digital puppetry*, (PIs: **C. E. Hughes**), 2010-2012.

**National Science Foundation**, *Water's Journey through the Everglades*, (PIs: E. Smith, **C. E. Hughes**, L. Walters, K. Kitalong, M. Johnson), 2007-2012.

**National Institutes of Health**, *ARRA: Using Mixed Reality to build peer resistance skills in Latina middle schoolers*, (PIs: Anne Norris, **C. E. Hughes**), 2010-2013.

**Office of Naval Research**, *3D Display and Capture of Humans for Live Virtual Training*, (PIs: Greg Welch, **C. E. Hughes**, Sumanta Pattanaik, Marshall Tappen), 2011-2013.

**Active through TeachLivE Auxiliary (1) and UCF Foundation (1)****Total active is approximately \$150,000/year with 2012 growth expected to result in \$1,000,000/year; no individual breakout exists on this kind of funding**

**Various Universities**, *TeachLivE™ Lab*, (PIs: M. Hynes, L. Dieker, **C. E. Hughes**), 2011-2012.

**Bill & Melinda Gates Foundation**, *TeachLivE™*, (PIs: L. Dieker, M. Hynes, **C. E. Hughes**), 2011-2013.

**Completed in 2011:**

**Army RDECOM**, *Mixed Reality Immersion Research*, (PIs: E. Smith, **C. E. Hughes**), 2010-2011.

**Florida Board of Governors**, *Florida Biomedical Engineering Partnership*, (PI: Tony Waldrop; Proposal Writers: L. Chow, **C. E. Hughes**, A. Kassab, V. Patel, Z. Qu), New Florida 2010 Clustering, 2010-11.

**West Virginia University**, *TeachME Classroom Sessions and Software Program Services*, (PIs: L. Dieker, **C. E. Hughes**, M. Hynes), 2010-2011.

**Old Dominion University Research Foundation**, *TeachME*, (PIs: L. Dieker, **C. E. Hughes**, M. Hynes), 2010-2011.

**University of Wisconsin Milwaukee**, *TeachME Classroom Sessions and Software Program Agreement*, (PIs: L. Dieker, **C. E. Hughes**, M. Hynes), 2011.

**University Center of Greenville**, *TeachME Classroom Sessions and Software Program*, (PIs: L. Dieker, **C. E. Hughes**, M. Hynes), 2010-2011.

**Completed Prior to 2011:**

**Utah State University**, *TeachME*, (PIs: **C. E. Hughes**, E. Smith), 2009-2010.

**National Science Foundation**, *DRU: Cognition in Natural Environments: Using Simulated Scenarios in Complex Decision Making Experiments*, (PIs: G. Harrison, S. Fiore, **C. E. Hughes**, E. Salas, S. Burke, S. Pattanaik, E. Rutström, C. B. Stapleton, J. Weishampel), 2006-2010.

**National Science Foundation**, *STTR Phase II: Developing a Mixed Reality Rehabilitation System*, (UCF PI: **C. E. Hughes**, E. Smith), joint with Virtual Reality Medical Center 2008-2010.

**I4 High Tech Corridor**, *STTR Phase II: Developing a Mixed Reality Rehabilitation System*, (PIs: **C. E. Hughes**, E. Smith), 2007- 2010.

**National Science Foundation**, *GRA VRMC Fellowship*, (UCF PIs: **C. E. Hughes**, E. Smith), 2007-2010.

**National Science Foundation**, *STTR Phase I: Developing a Mixed Reality Rehabilitation System*, (UCF PIs: **C. E. Hughes**, E. Smith), joint with Virtual Reality Medical Center, 2007.

**I4 High Tech Corridor**, *Developing a Mixed Reality Rehabilitation System*, (PIs: **C. E. Hughes**, E. Smith), 2007- 2010.

**Army RDECOM via IST**, *MR MOUT Revitalization*, (PIs: **E. Smith**, **C. E. Hughes**, D. Mapes, D. Hughes), 2008-2009.

**ARI via NAVAIR**, *Virtual Technologies and Environments (VIRTE) for Advanced Research on Agents and Teams*, (PIs: **D. Nicholson**, S. Burke, S. Fiore, **C. E. Hughes**, G. Martin, J. Rolland, E. Salas, E. Smith), 2006-2009.

**National Endowment for the Humanities**, *Come Back to the Fair*, (PIs: **L. Walters**, **C. E. Hughes**, K. Kitalong), 2007-2008.

**Air Force Office of Scientific Research**, *SBIR Phase I: A Mixed Reality System for Cognitive Rehabilitation of Traumatic Brain Injuries*, (UCF PIs: **C. E. Hughes**, C. Fidopiastis, D. Hughes, D. Mapes, E. Smith), joint with Virtual Reality Medical Center, 2007-2008.

**I4 High Tech Corridor**, *Developing a Mixed Reality Rehabilitation System for Stroke Patients*, (PIs: **C. E. Hughes**, E. Smith), 2007-2008.

**Army RDE Command**, *Evaluating the Impact of Mixed Reality on Human Performance and Interaction with Adolescents and Young Adults*, (PIs: **C. E. Hughes**, E. Smith, C. Stapleton), 2007.

**Department of Education**, *SBIR Phase I: The Virtual STAR Classroom Simulator*, (UCF PIs: **E. Smith**, **C. E. Hughes**, L. Dieker, M. Hynes), subcontract from Simiosys LLC, 2006.

**Army Research Institute**, *ARI Virtual Environment Research Testbed*, (PIs: **G. Martin**, **C. E. Hughes**, J. Daly, E. Smith), 2005-2006.

**Office of Naval Research DURIP (Defense University Research Instrumentation Program)**, *Mixed Reality: Anytime, Anywhere*, (PIs: **C. E. Hughes**, J. M. Moshell, S. Pattanaik, C. Stapleton, H. Foroosh), 2004-2005.

**Office of Naval Research**, *Research in Augmented and Virtual Environment Systems: Pervasive Computing in Augmented and Mixed Reality*, (PIs: **C. E. Hughes**, B. Goldiez, S. Teicher), 2003-2005.

**Office of Naval Research**, *Research in Augmented and Virtual Environment Systems: Rendering*, (PIs: **S. N. Pattanaik**, **C. E. Hughes**, J. P. Rolland, V. Sims, E. Reinhard), 2003-2005.

**Office of Naval Research**, *Research in Augmented and Virtual Environment Systems: Content*, (PIs: **C. B. Stapleton**, **C. E. Hughes**), 2003-2005.

**Office of Naval Research**, *Research in Augmented and Virtual Environment Systems: Battlefield Augmented Reality System*, (PIs: **B. Goldiez**, **C. E. Hughes**, C. B. Stapleton, K. Garfield), 2003-2005.

**Army RDE Command**, *The Enhancement of MOUT Training with Mixed Reality and Theme Park Technology*, (PIs: **C. Stapleton**, **C. E. Hughes**, J. M. Moshell), 2001-2005.

**Association to Preserve Eatonville Community**, *Carol Mundy Digital Archive Prototype Project*, (PIs: **C. E. Hughes**, J. M. Moshell), 2003-2004.

**Silicon Graphics**, *OpenIR Development*, (PIs: **J. M. Moshell**, **C. E. Hughes**), 2003. (Credit: 50% = \$20,000)

**Canon Mixed Reality Labs**, *Mixed Reality Infotainment*, (PIs: **C. Stapleton**, **C. E. Hughes**, J. M. Moshell, C. Ford) – \$200,000, 2003.

**Canon Mixed Reality Labs**, *MR Canon IAAPA*, (PIs: **C. Stapleton**, **C. E. Hughes**, J. M. Moshell), 2002.

**Canon Mixed Reality Labs**, *Mixed Reality Tests for Nickelodeon Studios*, (PIs: **C. Stapleton**, **C. E. Hughes**, J. M. Moshell), 2002.

**Army STRICOM**, *The Enhancement of Training in Virtual and Mixed Reality Environments with Realistic Vegetation*, (PIs: **C. E. Hughes**, J. M. Moshell, V. Sims, J. Weishampel), 2002-2003.

**Army STRICOM**, *Populating a MOU Facility with Spatially Registered Features: The Virtual Backlot*, (PIs: **C. E. Hughes**, J. M. Moshell, C. Stapleton, A. Cortes), 2002-2003.

**Army STRICOM**, *Tracking Systems for Multiplayer Mixed Reality*, (PIs: **C. Stapleton**, **C. E. Hughes**, J. M. Moshell, A. Cortes), 2002-2003.

**Army STRICOM**, *Virtual Object Rendering and Registration for Mixed Reality MOU*, (PIs: **J. M. Moshell**, **C. E. Hughes**, C. Stapleton, S. Pattanaik, J. Malala), 2002-2003.

**National Science Foundation**, *Augmented Reality and Interactive Distributed Physical Modeling*, (PIs: **J. Rolland**, **C. E. Hughes**, R. Parsons), 2000-2003.

**Army STRICOM**, *Automatic Construction and Evaluation of Efficient Databases for Virtual Simulation from SEDRIS Data*, (PIs: **J. M. Moshell**, **C. E. Hughes**, A. Cortes, V. Sims, G. Schiavone), 2000-2002.

**Orlando Science Center**, *Measure Me - An Interactive Exhibit*, (PIs: **J. M. Moshell**, **C. E. Hughes**, C. Stapleton), 2000-2002.

**I-4 Corridor Initiative and Real3D**, *Developing Content for the Virtual Theme Park*, (PIs: **J. M. Moshell**, **C. E. Hughes**), 1999-2000.

**Real3D**, *Empirical Studies of Graphics Acceleration for PC Environments*, (PIs: **J. M. Moshell**, **C. E. Hughes**), 1998.

**Advanced Research Projects Agency**, *ExploreNet*, (PIs: **J. M. Moshell**, **C. E. Hughes**), 1995-97.

**National Science Foundation**, *Undergraduate Parallel Processing*, (PIs: **R. K. Guha**, **C. E. Hughes**, Narsingh Deo, T. J. Frederick and A. Mukherjee), NSF Grant #CDA9115281. 1991-96.

**ARI-PM-TRADE**, *Visual Display Technologies for Simulation*, (PIs: **J. M. Moshell**, **C. E. Hughes**, E. Smart), 1990-92.

**Florida High Technology and Industry Council**, *Constraint-Based Declarative Programming for Modeling Complex Motions*, (PIs: **J. M. Moshell**, **C. E. Hughes**), 1990-91.

**Florida High Technology and Industry Council**, *A Graphical Simulation Environment for Problem Solving Based on Parallel Processing*, (PIs: **J. M. Moshell**, **C. E. Hughes**), 1988-90.

**ARI-PM-TRADE**, *Time Varying Visual Features for Low Cost Simulation Systems*, (PIs: **J. M. Moshell**, **C. E. Hughes**, E. Smart), 1988-89.

**ARI-PM-TRADE**, *Rapidly Reconfigurable Object-Oriented Databases for Simulation*, (PIs: **A. Orooji**, **C. E. Hughes**, J. M. Moshell), 1988-90

**Naval Training Systems Center**, *Action Graphics*, (PIs: **J. M. Moshell**, **C. E. Hughes**), 1987-88.

**Naval Training Systems Center**, *Ada Risk Assessment*, (PIs: **C. E. Hughes**, C. Bauer), 1985-1986.

**National Science Foundation**, *Computer System/VLSI Design Laboratory*, (PIs: **T. Frederick**, **C. E. Hughes**, R. Guha and A. Mukherjee), 1982.

**National Science Foundation**, *High School Microcomputer Science Education*, (PIs: **J. M. Moshell**, **C. E. Hughes**, R. M. Aiken), NSF Grant #SED79-18992, 1979-1982.

**National Bureau of Standards**, *Program Optimization and Specialization*, (PI: **C. E. Hughes**), 1979-1981.

**National Bureau of Standards**, *Incremental Program Analysis*, (PIs: **C. E. Hughes**, C. P. Pfleeger), 1979.

**National Science Foundation**, *Systematic Debugging*, (PIs: **C. E. Hughes**, C. P. Pfleeger), NSF Grant #MCS77-03308, 1977-1978.

**National Science Foundation**, *Development of a Machine Simulator for Teaching Operating Systems Concepts*, (PIs: **C. E. Hughes**, C. P. Pfleeger), NSF Grant #SED76-14494, 1976-1978.

### Recent Internal or State of Florida Grants:

*Haptic Feedback Architecture for remote Surgical Procedures*, (PIs: **Remo Pillat**, **C. E. Hughes**, A. Nagendran), UCF/IST SHELL Grant, 2011.

*Pre-Visualization of Content Creation and User Experience for Free-Choice Learning Venues*, (PIs: J. J. LaViola, **C. E. Hughes**, E. Smith), UCF Presidential Equipment Grant, 2008.

### **Invention Disclosures:**

Nicholas Beato, Charles E. Hughes, Mark Colbert, Yunjun Zhang, Kazumasa Yamazawa, “Real-time Chromakey Matting Using Image Statistics,” Filed April 1, 2009. Serial no: 61/165,740.

### **Ph.D. Direction (Completed):**

*Multitouch for General Purpose Computing: An Examination of Text Entry*, P. Varcholik, University of Central Florida, May 20011.

*Automation of Concept Acquisition*, S. Joshi, University of Central Florida, December 2008.

*Appearance-Driven Material Design*, M. Colbert, University of Central Florida, August 2008 (co-director: Erik Reinhard).

*Augmentation in Visual Reality*, Y. Zhang, University of Central Florida, August 2007.

*A Sparse Program Dependence Graph for Object-Oriented Programming Languages*, K. Garfield, University of Central Florida, December 2006 (co-director: Rebecca Parsons).

*Dynamic Shared State Maintenance in Distributed Virtual and Mixed Reality Environments*, F. Hamza-Lup, University of Central Florida, July 2004 (co-director: Jannick Rolland).

*View-centric Reasoning about Parallel and Distributed Computation*, M. Smith, Univ. of Central Florida, December 2000 (co-director: Rebecca J. Parsons).

*Parallel Execution Models and Algorithms for Constraint Logic Programming over a Real-Number Domain*, J. Burg, Univ. of Central Florida, May 1992 (co-director: Sheau-Dong Lang).

*Automatically Generating Syntax-Directed Editors for Graphical Languages*, F. Arefi, Univ. of Central Florida, August 1988 (co-director: David A. Workman).

*An Analytical Model for Evaluating Database Update Schemes*, K. Kinsley, Univ. of Central Florida, May 1983.

*Incremental Data Flow Analysis*, V. Ghodssi, Univ. of Central Florida, December 1983.

*Semantic Error Detection in Programming languages*, J. R. Mashey, Penn State University, May 1974.

### **Ph.D. Direction (Active):**

#### **Post-Candidacy:**

Nick Beato  
 Thomas Carbone (joint with S. Fiore)  
 Emiko Charbonneau (joint with J. LaViola)  
 Elena Erbiceanu  
 Jared Johnson  
 Glenn Martin  
 Remo Pillat (joint with H. Foroosh)  
 Yiyang “Lucy” Xiong

#### **Post-Qualifiers:**

Steven Braeger  
 Sarah Loewy (joint with H. Foroosh)  
 Juliet Norton (joint with J. LaViola)

#### **Pre-Qualifiers:**

David Crossmier  
 Vera Kasakova  
 Robert Michlovitz  
 Aleshia Panbamrung  
 Lijuan “Alice” Yin (joint with S. Pattanaik)

## Other Student Mentoring:

### Current Undergraduates

Jennifer Graham (RAMP scholar)  
Michael Hopper  
Kia Manoochehri  
Corlan McDonald (EXCEL YES student)  
Erica Terry (EXCEL YES student)  
Kelly Vandegeer  
Michael Weinberg (EXCEL YES student)

### Recent Undergraduates

Alex Banke (2011)  
Steven Braeger (2007-20010; HIM thesis Fall 2009)  
Emiel de Munck (2010-2011; Dutch intern)  
Geert Lugtenberg (2010-2011; Dutch intern)  
Sarah Loewy (2008-2010)  
Rachel Mansfield (2006-2007; HIM thesis August 2007)  
Britney Mendez (2009-2010; EXCEL YES student)  
Chris Sardinas (2010-2011; RAMP scholar)  
Elizabeth Starnes (2009-2010; EXCEL YES student)  
Peter Tonner (2009-2011; RAMP scholar)  
Diego Velasquez (2010-2011; RAMP scholar)  
Kyle Walls (2011; EXCEL YES student)

### Current and Very Recent High School Students

Neel Patel (2009-2012; accepted to Cal Tech)  
Nick Stanley (2011; now at Carnegie-Mellon)

## Publications: (\* reflects current or former student co-authors)

### Journals/Society Magazines:

1. P. Varcholik\*, J. J. LaViola and **C. E. Hughes**, "An Exploration of Multi-Touch Input for Text Entry," *International Journal of Human-Computer Studies*, in press.
2. L. C. Walters, D. E. Hughes and **C. E. Hughes**, "Interconnections: Revisiting the Future," *Game and Culture*, in press.
3. S. Risi\*, **C. E. Hughes** and K. O. Stanley, "Evolving Plastic Neural Networks with Novelty Search," *Adaptive Behavior*, 18(6), December 2010, 470-491.
4. N. Beato\*, M. Colbert\*, Y. Zhang\*, K. Yamazawa and **C. E. Hughes**, "Interactive Chroma-keying for Mixed Reality," *Computer Animation and Virtual Worlds* 20(2-3), June 2009, 405-415.
5. S. M. Fiore, G. W. Harrison, **C. E. Hughes** and E. Rutström, "Virtual Experiments and Environmental Policy," *Journal of Environmental Econ. and Management* 57(1), Jan 2009, 65-86.
6. L. Dieker, M. Hynes, **C. E. Hughes** and E. Smith, "Implications of Mixed Reality and Simulation Technologies on Special Education and Teacher Preparation," *Focus on Exceptional Children*, 40(6), February 2008, 1-20.
7. M. Colbert\*, E. Reinhard and **C. E. Hughes**, "Painting in High Dynamic Range," *Journal of Visual Communication and Image Representation*, 18(5), October 2007, 387-396.
8. P. Micikevicius\* and **C. E. Hughes**, "Visibility-based Forest Walk-through Using Inertial Level of Detail Model," *Journal of Defense Modeling and Simulation*, 4(2), April 2007, 80-96.
9. C. M. Fidopiastis, C. B. Stapleton, J. D. Whiteside, **C. E. Hughes**, S. M. Fiore, G. A. Martin\*, J. P. Rolland and E. M. Smith, "Human Experience Modeler: Context Driven Cognitive Retraining to Facilitate Transfer of Training," *CyberPsychology and Behavior* 9(2), April, 2006, 183-187.
10. C. B. Stapleton and **C. E. Hughes**, "Believing is Seeing," *IEEE Computer Graphics and Applications* 27(1), January/February 2006, 80-85.
11. R. Xu\*, S. N. Pattanaik and **C. E. Hughes**, "HDR Still Image Encoding in JPEG 2000," *IEEE Computer Graphics and Applications*, 26(6), November/December 2005, 69-76.

12. **C. E. Hughes**, C. B. Stapleton, D. E. Hughes and E. Smith, "Mixed Reality in Education, Entertainment and Training: An Interdisciplinary Approach," *IEEE Computer Graphics and Applications*, 26(6), November/December 2005, 24-30.
13. J. Konttinen\*, **C. E. Hughes** and S. N. Pattanaik, "The Future of Mixed Reality: Issues in Illumination and Shadows," *Journal of Defense Modeling and Simulation* 2(1), January 2005, 51-59.
14. C. B. Stapleton and **C. E. Hughes**, "Interactive Imagination: Tapping the Emotions through Interactive Story for Compelling Simulations," *IEEE Computer Graphics and Applications* 24(5), September/October 2003, 11-15.
15. M. L. Smith\*, R. J. Parsons and **C. E. Hughes**, "View-centric Reasoning for Linda and Tuple Space Computation," *IEE Proceedings-Software* 150(2), April 2003, 71-84.
16. C. B. Stapleton, **C. E. Hughes**, J. M. Moshell, P. Micikevicius\* and M. Altman\*, "Applying Mixed Reality to Entertainment," *IEEE Computer* 35(12), December 2002, 122-124.
17. **C. E. Hughes**, J. M. Moshell, D. Reed\*, D. Z. Chase and A. F. Chase, "The Caracol Time Travel Project" *The Journal of Visualization and Computer Animation* 12(4), September, 2001, 203-214.
18. J. X. Chen\*, N. Lobo, **C. E. Hughes** and J. M. Moshell, "Real-time Fluid Simulation in a Networked Virtual Environment" *IEEE Computer Graphics and Applications* 17(3), pp. 52-61, May-June 1997.
19. **C. E. Hughes** and J. M. Moshell, "Shared Virtual Worlds for Education: The ExploreNet Experiment" *Multimedia Systems* 5(2), March, 1997, 145-154.
20. J. Burg\*, S. D. Lang and **C. E. Hughes**, "Intelligent Backtracking in CLP(R)," *Annals of Artificial Intelligence and Mathematics* 17(3-4), 1996, 189-212.
21. J. M. Moshell and **C. E. Hughes**, "The Virtual Academy: A Simulated Environment for Constructionist Learning" *International Journal of Human-Computer Interaction* 8(1), 1996, 95-110.
22. J. X. Chen\*, J. M. Moshell, **C. E. Hughes**, B. Blau\* and X. Li\*, "Distributed Virtual Environment Real-Time Simulation Network," *Advances in Modeling and Analysis B*, 31(1), 1994, 1-7.
23. K. Kinsley\* and **C. E. Hughes**, "Analysis of a Virtual Memory Model for Maintaining Database Views," *IEEE Transactions on Software Engineering*, May, 1992, 402-409.
24. F. Arefi\*, D. Workman and **C. E. Hughes**, "Automatically Generating Visual Syntax-Directed Editors," *Communications of the ACM*, 1990, 349-360.
25. K. Kinsley\* and **C. E. Hughes**, "Evaluating Database Update Schemes: A Methodology and its Applications to Distributive Systems," *IEEE Trans. on Software Engineering*, 1988, 1081-1089.
26. M. D. Petty\*, J. M. Moshell and **C. E. Hughes**, "Tactical Simulation in an Object-Oriented Animated Graphics Environment," *ACM SIGSIM Simulation Digest* 19(2), June 1988, 31-46.
27. **C. E. Hughes**, J. M. Moshell, L. W. Lacy\* and R. L. Lewis\*, "Action Graphics: An Interactive Spreadsheet-Based Animation System for Simulation and Training," *Simulators V*, The Society for Computer Simulation International, Simulation Series, 19, 4, 1988, 474-478.
28. M. Petty\*, J. M. Moshell and **C. E. Hughes**, "Tactical Simulation in an Object-Oriented Animated Graphics Environment," *ACM SIGSIM Simulation Digest* 19(2, June 1988), 31-46.
29. **C. E. Hughes** and S. M. Selkow, "The Finite Power Property for Context-Free Languages," *Journal of Theoretical Computer Science*, 15, 1981, 111-114.
30. **C. E. Hughes** and D. W. Straight, "Word Problems for Bidirectional, Single Premise Post Systems," *Notre Dame Journal of Formal Logic*, 21, 1980, 501-508.
31. **C. E. Hughes**, "Derivatives and Quotients of Prefix-Free Context-Free Languages," *Information and Control*, 45, 1980, 229-235.
32. **C. E. Hughes** and C. P. Pflieger\*, "ASSIST-V: An Environment Simulator for Systems Software Development," *IEEE Transactions on Software Engineering*, 4, 1978, 526-530.
33. **C. E. Hughes**, "The Equivalence of Vector Addition Systems to a Subclass of Post Canonical Forms," *Information Processing Letters*, 7, 1978, 201-204.
34. **C. E. Hughes** and W. E. Singletary, "The One-One Equivalence of Some General Decision Problems," *Notre Dame Journal of Formal Logic*, 18, 1977, 305-309.
35. **C. E. Hughes**, "Two Variable Implicational Calculi of Prescribed Many-One Degrees of Unsolvability," *Journal of Symbolic Logic*, 41, 1976, 35-44.
36. **C. E. Hughes**, "A Reduction Class Containing Formulas with One Monadic Predicate and One Binary Function Symbol," *Journal of Symbolic Logic*, 4, 1976, 45-49.
37. **C. E. Hughes**, "The General Decision Problem for Markov Algorithms with Axiom," *Notre Dame Journal of Formal Logic*, 16, 1975, 208-216.

38. **C. E. Hughes** and W. E. Singletary, "Triadic Partial Implicational Propositional Calculi," *Z. Math Logik und Grundlagen*, 21, 1975, 21-28.
39. **C. E. Hughes**, "Sets Derived by Deterministic Systems with Axiom," *Z. Math Logik und Grundlagen*, 21, pp. 71-80, 1975.
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96. J. M. Moshell and **C. E. Hughes**, "Graphical Spreadsheet Environments for Problem Solving," *NCGA Computer Graphics '87 Conference Proceedings*, Philadelphia, 1987, 593-602.
97. **C. E. Hughes**, J. M. Moshell, L. W. Lacy\*, R. L. Lewis\*, D. Blower "An Educational Animation System Based on Class Inheritance," *NCGA Computer Graphics '87 Conference Proceedings*, Philadelphia, 1987, 618-627.
98. **C. E. Hughes** and J. M. Moshell, "Visible Pascal: A Graphics-Based Learning Environment," *NCGA Computer Graphics '86 Conference Proceedings*, Anaheim, CA, 1986.
99. K. Kinsley\* and **C. E. Hughes**, "Evaluating Database Update Schemes: A Methodology and its Applications to Distributive Systems," *Proceedings of COMPSAC '86*, Chicago, 1986, 351-357.
100. **C. E. Hughes** and J. M. Moshell, "Picture Programming: A Graphical Programming Environment," *NCGA Computer Graphics '85 Conference Proceedings*, 26, Dallas, 1985, 290-299.
101. **C. E. Hughes** and J. M. Moshell, "A Programming Environment for Pre-literate Children," *Proceedings of the 1983 National Education Computing Conference*, Baltimore, MD, 103-106, 1983.
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103. **C. E. Hughes** and J. M. Moshell, "Computer Power: A Coordinated Series of High School Curricula," *Proceedings of the Association for Educational Data Systems Conference*, Orlando, FL, 1982, 350-355.
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105. R. M. Aiken, J. M. Moshell, **C. E. Hughes** and C. R. Gregory\*, "Insights into Universal Computer Education," *ACM SIGCSE Bulletin*, 13, Eleventh Symposium on Computer Science Education, 1981, 8-11.
106. R. M. Aiken, **C. E. Hughes** and J. M. Moshell, "An Introductory Computer Science Curriculum Based on an Affordable Computer System," *Proceedings of IFIP Working Conference on Microcomputers and Secondary Education*, Paris, April 1980.
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109. F. Leaders, M. Van Hoose, K. O'Kane, and **C. E. Hughes**, "A computer based system for acquisition and reporting of animal data: I. The biomedical scientists' perspective," *15th Annual Meeting of the Drug Information Association*, Chicago, 1979.
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111. R. M. Aiken, **C. E. Hughes** and J. M. Moshell, "An Integrated Small Computer Laboratory Using a Central Disk Storage Facility," *ACM SIGCSE Bulletin*, 10, Eighth Symposium on Computer Science Education, 1978, 35-37.

112. W. Haynes\*, **C. E. Hughes** and C. P. Pfleeger, “Oracle: A Tool for Learning Compiler Writing,” *ACM SIGCSE Bulletin*, 9, Seventh Symposium on Computer Science Education, 1977, 37-51.
113. **C. E. Hughes** and C. P. Pfleeger, “ASSIST-V: A Tool for Studying the Implementation of Operating Systems,” *ACM SIGCSE Bulletin*, 8, Sixth Symposium on Computer Science Education, 1976, 167-173.
114. **C. E. Hughes** and J. Walker, “POPSS – A System for Modeling and Analyzing Operating System Resource Allocation Strategies,” *Proceedings of the Third Texas Conference on Computing Systems*, 1974, 3.6.1-3.6.8.
115. **C. E. Hughes** and J. Walker, “POPSS – A Parametric Operating System Simulator,” *ACM SIGCSE Bulletin*, 5, Third Symposium on Computer Science Education, 1973.

### Text and Educational Books:

**C. E. Hughes** and J. M. Moshell, *Visible Pascal*, John Wiley & Sons, Inc., New York, 1985.

**C. E. Hughes**, *Picture Programming*, John Wiley & Sons, Inc., New York, 1983.

J. M. Moshell, **C. E. Hughes** et al., *Computer Power: A First Course in Using the Computer*, McGraw-Hill, New York, Teacher's Text – 340 pages, Student's Text – 193 pages, plus software, 1982.

**C. E. Hughes**, C. P. Pfleeger and L. Rose, *Advanced Programming Techniques: A Second Course in Programming Using FORTRAN*, John Wiley & Sons, Inc., New York, 287 pages, 1978. Russian Translation, 1981.

A. I. Forsythe, **C. E. Hughes**, R. M. Aiken and E. I. Organick, *Computer Science: Programming in BASIC*, John Wiley & Sons, Inc., New York, 148 pages, 1976. Japanese Translation, 1981.

A. I. Forsythe, R. M. Aiken, **C. E. Hughes** and E. I. Organick, *Computer Science: Programming in FORTRAN with WATFOR/WATFIV*, John Wiley & Sons, Inc., New York, 200 pages, 1975. Japanese Translation, 1980.

### Selected Recent External Exhibits and Installations:

“Digital Puppetry,” *IITSEC 2011*, December 3-6, 2011, Orlando, FL.

“Interconnections: Revisiting the Future,” Demonstrations at *American Association for the Advancement of Science 2011 (AAAS 2011): Science without Borders*, February 17-21, 2011, Washington, DC.

“Interconnections: STEM Learning through the Lens of a Virtual 3D 1964/65 New York World’s Fair Environment,” *Museums and the Web 2010*, April 13-17, 2010, Denver, CO.  
[http://www.archimuse.com/mw2010/abstracts/prg\\_335002402.html](http://www.archimuse.com/mw2010/abstracts/prg_335002402.html)

“Medical Applications of Games,” Mixed Reality experiences developed at SREAL/MCL for *Otronicon 2009 & 2010*, Orlando Science Center, January 2009 & January 2010.

“Mixed Reality in Situational Awareness Training,” *IITSEC 2009*, November 30 – December 3, 2009, Orlando, FL.

“Lunar Lunge,” Installation of MR experience for high school students at *Army STTC*, Orlando, FL, July 2008.

“MR/MOUT,” Installation of mixed reality experience in military training at *Army STTC*, Orlando, FL, March 2003-2008.

### Selected Invited Talks (since 2009):

“Realism in Simulation-Based Training Environment via Digital Puppetry”  
*Tufts Health Care Institute (THCI) Program on Opioid Risk Management*  
 Boston, MA, March 10-11, 2011.

“Gepetto: Support for Learning through Digital Puppetry”  
*ESD. 937 Geospatial Leadership: Fusing State of the Practice with State of the Art for Multidisciplinary Field Work in Non-Permissive Environments*  
 MIT Geospatial Data Center, Harvard Kennedy School Center for Public Leadership, UCF IST course  
 Orlando, FL, January 10-13, 2011.

“Interdisciplinary Research: Preparing Computer Science Students for the Changing Landscape”

*Information Management Forum Senior Executive Conference*

Orlando, FL, October 4-5, 2010

“Benefits and Challenges of Collaborative Research Proposals”

UCF Collaborative Research Opportunities Workshop

Orlando, FL April 5, 2010

“Transforming Lives: Technology”

Innovation Workshop

*International Symposium on Mixed and Augmented Reality 2009 (ISMAR 2009)*,

Orlando, FL, October 19-22, 2009.

“Creating Mixed Reality Experiences”

*International Symposium on Mixed and Augmented Reality 2009 (ISMAR 2009)*,

Orlando, FL, October 19-22, 2009.

“Enhancing Human Performance”

co-presenters: C. Fidopiastis, K. Stanney

*International Symposium on Mixed and Augmented Reality 2009 (ISMAR 2009)*,

Orlando, FL, October 19-22, 2009.

“An Innovation Workshop on Mixed Reality”

co-presenters: E. Smith, D. Hughes, A. Salva

*Medical Technology, Training and Treatment (MT3) Conference*, Orlando, FL, May 28, 2009.

“Virtual and Mixed Reality: New Ways of looking at KM”

*Knowledge Management 2009*, Washington, DC, April 28-29, 2009.

“Clinical Experiences via Virtual World”

co-presenters: L. Dieker, E. Smith, O. Bedesem, M. Kalaf and R. Moss,

*American Association of Colleges for Teacher Education 61<sup>st</sup> Annual Meeting and Exhibits (AACTE 2009)*, Chicago, IL, February 6-9, 2009.

“Using Mixed Reality to Assess and Improve Performance”

*Naval Research Advisor Committee*, Office of Naval Research, Washington, DC, January 29, 2009.

“Using Mixed Reality to Assess and Improve Performance”

*Jet Propulsion Lab*, Pasadena, CA, January 22, 2009.

“Mixed Reality for Cognitive and Motor Rehabilitation and Assessment”

Workshop co-presenters: C. Fidopiastis, D. Hughes, A. Salva, R. Shumaker

*Medicine Meets Virtual Reality 2009*, Long Beach, CA, January 19-22, 2009.

## Other Media:

### National Press (since 2010):

“Teaching Avatars,” *Education Week*, April 4, 2011.

<http://www.edweek.org/tsb/articles/2011/04/04/02avatars.h04.html?intc=es>

Our cultural heritage research was selected by NSF for presentation at the annual American Association for the Advancement of Science meeting in Washington, DC on February 16-21, 2011.

“Virtual Students Are Used to Train Teachers,” *Education Week*, January 7, 2011

[http://www.edweek.org/ew/articles/2011/01/05/15simulate\\_ep.h30.html](http://www.edweek.org/ew/articles/2011/01/05/15simulate_ep.h30.html)

“Virtual Game targets Young Latinas,” *National Latina Institute for Reproductive Health*, Aug. 3, 2010

<http://latinainstitute.wordpress.com/2010/08/03/virtual-game-targets-young-latinas-with-more-bogus-abstinence-only-tactics/>

“Student avatars could help improve teacher training,” *EducationNewsToday*, August 7, 2010

[http://www.educationnews.org/ednews\\_today/94735.html](http://www.educationnews.org/ednews_today/94735.html)

“Let’s Play Abstinence—with Avatars!,” *MS. Blog*, Aug. 6, 2010

<http://msmagazine.com/blog/blog/2010/08/06/let's-play-abstinence-with-avatars>

“Avatars to Teach the Teachers,” *Inside Higher Ed* and *USA Today*, July 7, 2010

<http://www.insidehighered.com/news/2010/07/07/avatars>

“Students Aid World’s Fair Project,” *Mining Gazette*, may 14, 2010

<http://www.mininggazette.com/page/content.detail/id/510075.html?nav=5006>

### **National Press (selected from those appearing prior to 2010):**

“Virtual reality fires Up Research efforts,” *NSF News*, August 24, 2009.

[http://www.nsf.gov/news/special\\_reports/science\\_nation/wildfire.jsp](http://www.nsf.gov/news/special_reports/science_nation/wildfire.jsp)

“Saved by the Virtual Bell,” A July 30, 2008 on-line video at *MSNBC* on our TeachME system.

<http://www.msnbc.msn.com/id/21134540/vp/25933859#25933932>

### **Selected Recognitions:**

TeachLive Selected by American Association of Colleges of Teacher Education for *2011 Best Practice Award for Innovations in Technology*

Senior Member, Institute of Electrical and Electronics Engineers (IEEE) & IEEE Computer Society

Senior Member, Association for Computing Machinery (ACM)

UCF Teaching Incentive Award, 2009

Pegasus Professor, 2007

Research Incentive Award, 2007

UCF Teaching Incentive Award, 2002

Excellence in Undergraduate Teaching, UCF, 2001 (top university teaching award)

Excellence in Undergraduate Teaching, UCF College of Engineering and Computer Science, 2001

Professional Excellence Program Award, 1996 (Recognition of research achievements)

UCF Teaching Incentive Award, 1995

Excellence in Teaching, UCF College of Arts and Sciences, 1992

IEEE Florida Council Outstanding Engineering Educator, 1989

### **Current and Recent Professional Service:**

#### **NSF Review panels**

Computer Research Infrastructure Panel (Human Centered Computing Cluster), November 2010

Creative IT Panel, January 2007, 2010

#### **Societies, Journals and Conferences**

Entertainment Computing, Associate Editor, 2011-

IEEE VR 2012 Program Committee 2011-

HCI 2009-2012 Program Committee, 2008-

DMDCM 2010-2011 Program Committee, 2010-

ISMAR 2010 Program Committee (Science and Arts&Humanities reviewer), 2009-2010

Journal of Cybertherapy and Rehabilitation, Member of Editorial Board, 2009-

ISMAR 2009 Tutorial Chair, 2009

Eurographics 2008 Short Papers Program Committee, 2007-2008

International Conference on Information and Knowledge Sharing Program Committee, 2002-2006

Reviewer for IEEE CG&A, IEEE VR, Virtual Reality, Eurographics Symposium on Rendering,

International Symposium on Mixed and Augmented reality, International Conference on Digital Media and Digital Content Management, Journal of Cybertherapy and Rehabilitation. Advances in Computer Entertainment Technology

#### **UCF Electrical Engineering and Computer Science**

Computer Science Division Executive Committee, 2011-

Computer Science Graduate Committee, 2003-2006, 2010-

Computer Science Promotion & Tenure, Chair, 2010, 2011

Associate Director, 2007-2008

ABET Accreditation Team Member, 2007-2008

Computer Science Graduate Coordinator, 2003-2007  
Computer Science Self Assessment Committee, Chair, 2003-.2007  
Information Technology Advisory Committee, 2003-2007  
NRC CS Graduate Program Assessment, 2006-2007  
Undergraduate Curriculum Development Committee, Member, 2005-2006  
Computer Science Budget Advisory Committee, Member, 2003-2005  
Computer Science Director's Search Committee, 2003-2004  
Computer Science Undergraduate Coordinator and Program Committee Chair, 1999-2001  
CSAB Accreditation Committee, Member, 2000-2001  
Accountability Committee, Member, 2000-2001  
Information Technology Program Founding Director and Program Committee Chair, 2000-2001  
Strategic Planning Review Committee, Chair 2001

#### **UCF College of Engineering and Computer Science**

CECS Research Committee, Member 2011-  
In-House Research Committee, Chair, 2010, 2011  
RIA Selection Committee, Chair, 2009-2011  
Bioengineering Minor Admission Committee, 2009-  
Graduate Program Coordinators Committee, Member, 2003-2007  
I2Labs Fellowship Selection Committee, Member, 2005-2007  
I2Lab Steering Committee, Member 2006-2007  
TIP Awards Committee, Chair, 2006  
Civil and Environmental Engineering Chair Search Committee, Chair, 2004-2005  
Director of Development Search Committee, Member 2001  
ABET Accreditation Committee, Member, 2000

#### **UCF Institute for Simulation and Training**

Synthetic Reality Laboratory, Director 2010-  
Media Convergence Laboratory, Chief Scientist, 2001-2010; Director, 2006-2010  
Research Associate Search Committee, 2006-2007  
M&S Graduate Program Faculty Member, 2004-  
IST Contributing Faculty, 1982-

#### **UCF School of Visual Arts and Design, and Florida Interactive Entertainment Academy**

Promotion and Tenure Committee, Member, 2005-  
Film Faculty Search Committee, Chair, 2006  
School of Film and Digital Media Promotion/Tenure Review Committee, Chair, 2005  
Florida Interactive Entertainment Academy Faculty Search Committee, 2005  
Florida Interactive Entertainment Academy Planning Committee, 2004-2005  
Digital Media Faculty Search Committee, 2002-2005  
Digital Media Industrial Affiliates Committee, Member, 2000-2005  
Arts and Sciences Digital Media Director Search Committee, Member, 2000-2001

#### **UCF (other)**

STEM Research and Education Council, Member, 2010, 2011  
Nanoscience Director Review Committee, 2009  
Cognitive Sciences Faculty Member, 2007-  
Commencement and Convocation Committee, Member, 2004-2011  
Promotion/Tenure Review Committee, Member, 2005-2007; Chair, 2006-2007  
Text and Technology Ph.D. Program Affiliate Faculty Member, 2000-.2007  
Task Force on International Student Services. 2004-2005  
Interdisciplinary Council, 1998-2000  
UCF Strategic Planning Council, Chair 1991-94, Executive Comm., 1990-2001  
Chaired Review of All UCF Academic Programs, 1995-1997