Hughes, Charles E.

February 2025

Pegasus Professor: Department of Computer Science
Secondary Appointments in Department of Electrical and Computer Engineering, the School of Modeling, Simulation & Training Graduate Program, College of Community Innovation & Education, and Department of Games & Interactive Media
Co-Director: Synthetic Reality Laboratory: https://sreal.ucf.edu/
Co-Lead: Learning Sciences Cluster: https://www.ucf.edu/research/learning-sciences/
Member: Disabilities, Aging, and Technology Cluster: https://www.ucf.edu/research/disability-aging-technology/
Member: Center for Research in Education Simulation Technology: http://teachlive.org
University of Central Florida (https://www.ucf.edu)
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Home Page: https://www.cs.ucf.edu/~ceh/
Google Scholar: https://tinyurl.com/rmy8xbtw

BIOGRAPHICAL DATA

Education:

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

Academic Experience:

1980-Present: Professor, Computer Science, University of Central Florida
    2020-2022: Interim Director, School of Modeling Simulation & Training Graduate Programs
    2019-Present: Professor, College of Community Innovation and Education
    2019-Present: Professor, School of Modeling, Simulation and Training
    2018-Present: Co-Director, Center for Research in Education Simulation technology (CREST)
    2017-Present: Co-Lead of Learning Sciences Faculty Cluster
    2010-Present: Founding Director and Current Co-Director, Synthetic Reality Laboratory
    2007-Present: UCF Pegasus Professor
    2005-Present: Professor, Games and Interactive Media
    1982-Present: Contributing Faculty, Institute for Simulation & Training
    2006-2010: Director, Media Convergence Laboratory
    2007-2008: Associate Director, School of EECS
    2007-2009: Cognitive Sciences Faculty
    2001-2009: Affiliate Faculty, Text & Technology PhD Program
1974-1980: Assoc. Prof. (74-78); Prof. and Assoc. Chair (78-80), Computer Science, Univ. of Tennessee
1972-1974: Assistant Professor of Computer Science, Pennsylvania State Univ.
1971-1972: Postdoctoral Research Associate – National Research Council/NIST, Washington, D.C.
1968-1971: Instructor of Computer Science, Pennsylvania State Univ.
1967-1968: Research Assistant, Computer Science, Pennsylvania State Univ.

Industrial Experience:

1966-1968: Computer Programmer – Applied Research Lab., State College, PA
1962-1966: Computer Programmer – Radio Corp. of America, Burlington, MA

TEACHING

Teaching Interests:

Theory of Computation, Design & Analysis of Algorithms, Systems Programming, Virtual Environments

Teaching Recognitions at UCF:

Teaching Incentive Awards: 2015, 2009, 2002, 1995
College Award for Excellence in Undergraduate Teaching: 2001, 1992
University Award for Excellence in Undergraduate Teaching: 2001

Ph.D. Direction (Completed):

1. Leena Alghamdi, *Improving Smart Home Access Control Mechanisms to Account for Community-Based Sharing beyond the Home*, May 2025 (Primary Advisor: Pamela Wisniewski), Albaha University, Saudi Arabia.
2. Xavier Caddle, *Mosafely, Building an Open-Innovation Community to Promote Adolescent Online Safety Through Multi-Disciplinary Collaborations and Teen-Centered Risk Detection*, August 2024 (Primary Advisor: Pamela Wisniewski), FAMU, Tallahassee, FL.
3. Julie Kent, *Using Simulation for Law Enforcement De-Escalation*, December 2022, Mitre Corp., Orlando, FL.
4. Kamran Ali, *Optimal Feature Learning for Facial Expression Recognition*, December 2021, National University of Computer and Emerging Sciences, Karachi, Pakistan.
5. Anthony Wehrer, *Multi-Modal Interface for Sensemaking of Graph-Connected Datasets*, December 2019, Simetri, Inc., Winter Park, FL.
6. Thomas Carbone, *Psychomotor Skill Measurement of Video Game Players*, December 2018, Iron Galaxy Studios, Orlando, FL.
7. Sungchul Jung, *Personalized Digital Body: Enhancing Body Ownership and Spatial Presence in Virtual Reality*, May 2018, Kennesaw State University, Kennesaw, GA.
8. Ahmad Abualsamid, *Applied Software Tools for Supporting Children with Intellectual Disabilities*, May 2018, Reach Beyond Academy, Winter Springs, FL.
9. Behnaz Nojavanasghari, *Complex Affect Recognition in the Wild*, December 2017 (co-director: L. P. Morency, Carnegie Mellon University), Cognitiv, Bellevue, WA.
10. Antoniya Petkova, *Network Partitioning in Distributed Agent-Based Models*, December 2017 (co-director: Narsingh Deo), Intel Corporation, Phoenix, AZ.
11. Roghayeh Barmaki, *Gesture Assessment of Teachers in an Immersive Rehearsal Environment*, August 2016, Assistant Professor, University of Delaware, Newark, DE.
12. Alyssa Tanaka, *The Effect of Videogame Play on Robotics Surgery Skill Acquisition*, December 2015, Research Scientist, Soartech, Orlando, FL.
13. Aleshia Hayes, *The Experience of Presence and Social Presence in a Virtual Learning Environment as Impacted by the Affordance of Movement Enabled Motion Tracking*, August 2015, Assistant Professor University of North Texas, Denton, TX.
14. Yiyan Xiong, *Automatic 3D Human Modeling: An Initial Stage towards 2-Way Inside Interaction in Mixed Reality*, May 2014. Member of Technical Staff, Advanced Micro Devices, Orlando, FL.
15. Emiko Charbonneau, *Bridging the Gap between Fun and Fitness: Instructional Techniques and Real-World Applications for Full-Body Dance Game*, August 2013 (co-director: Joseph LaViola). Microsoft, Redmond, WA.
16. Nicholas Beato, *Towards Real-Time Mixed Reality Matting in Natural Scenes*, December 2012. Software Engineer III, Google, Mountain View, CA.
17. Jared Johnson, *Algorithms for Rendering Optimization*, University of Central Florida, May 2012. Software Engineer III, Google, Mountain View, CA.
18. Glenn Martin, *Automatic Scenario Generation Using Procedural Modeling Techniques*, University of Central Florida, May 2012. Director, Interactive Realities Lab, Institute for Simulation & Training, University of Central Florida, Orlando, FL.

19. Paul Varcholik, *Multitouch for General Purpose Computing: An Examination of Text Entry*, University of Central Florida, May 2011 (co-director: Joseph LaViola). Programming Faculty, Florida Interactive Entertainment Academy, University of Central Florida, Orlando, FL.

20. Sameer Joshi, *Automation of Concept Acquisition*, University of Central Florida, December 2008. CEO, Datanova Scientific LLC, Washington, DC.

21. Mark Colbert, *Appearance-Driven Material Design*, University of Central Florida, August 2008 (co-director: Erik Reinhard). Google Search Front-End Experience Lead Manager, Google, Mountain View, CA.

22. Yunjun Zhang, *Augmentation in Visual Reality*, University of Central Florida, August 2007. Member of Technical Staff, Advanced Micro Devices, Orlando, FL.

23. Garfield, *A Sparse Program Dependence Graph for Object-Oriented Programming Languages*, University of Central Florida, December 2006 (co-director: Rebecca Parsons). Professor, Electrical, Computer, Software & Sys. Eng., Embry-Riddle Aeronautical University, Daytona Beach, FL.

24. Felix Hamza-Lup, *Dynamic Shared State Maintenance in Distributed Virtual and Mixed Reality Environments*, University of Central Florida, July 2004 (co-director: Jannick Rolland). Professor, Computer Science, Georgia Southern University, Savannah, GA.

25. Marc Smith, *View-centric Reasoning about Parallel and Distributed Computation*, Univ. of Central Florida, December 2000 (co-director: Rebecca J. Parsons). Professor, Computer Science, Vassar College, Poughkeepsie, NY.

26. Jennifer Burg, *Parallel Execution Models and Algorithms for Constraint Logic Programming over a Real-Number Domain*, Univ. of Central Florida, May 1992 (co-director: Sheau-Dong Lang). Professor, Computer Science, Wake Forest University, Winston-Salem, NC.

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

28. Kathryn Kinsley, *An Analytical Model for Evaluating Database Update Schemes*, Univ. of Central Florida, May 1983. President, Datawise Inc., Orlando, FL.

29. Vida Ghodssi, *Incremental Data Flow Analysis*, Univ. of Central Florida, December 1983. Director of Software Development, Oracle, Sunnyvale, CA.

30. John R. Mashey, *Semantic Error Detection in Programming Languages*, Penn State University, May 1974. Venture Capitalist and Consultant to VC Firms; Trustee, Computer History Museum; Former Chief Scientist at Silicon Graphics, Mountain View, CA.

Recent and Active Postdoctoral Scholars

Kamran Ali, CS, NSF-funded (ended summer 2024)
Tuğba Kamalı Arslantaş, Turkish Government and Fullbright Fellow (ended summer 2024)
Caitlyn Bukaty, CCIE, US Department of Education-funded (ended fall 2022)
Angelica Fulchini Scruggs, CCIE, US Department of Education-funded (ended fall 2022)
Rachel Hallett-Njuguna, CCIE, US Department of Education-funded (now a faculty member at FSU)
Shaunn Smith, CCIE, US Department of Education-funded (now at UCP of Central Florida)

Ph.D. Direction (Active):

Post-Candidacy:
Erik Sands (M&S Program)

Pre-Candidacy:
Lori Dunlop-Pyle (M&S Program)

Other Student Research Mentoring:

Recent BS/MS Students:
Ethan Bliss (2024); NSF REU; Entered Stanford Graduate Program fall 2024; still collaborates
Jay Doshi (2023-); NSF REU; Entered UCF Graduate Program fall 2024; still collaborates
Kevin Frazier (2023-24); NIH INTEPID Program
Bryce Green, Brendan Smith, Glenroy Little, Maksim Petrushin, Samuel Rodriguez (2023-24) CS Senior Design

John Murphy (2022-23); Graduated May 2023
Oluwatomisin Obajemu (2022); MS thesis primary advisor Pamela Wisniewski
Sachin Shah (2021-2022); NSF and ED RA; Entered UMD Ph.D. Program fall 2022; still collaborates
Andrew Valentin (2023); NSF REU/NSF EXCEL Program

Current Undergraduate and MS Students
Kensley Cadet (2023-); NIH INTEPID Program
Anthony Casseus (2023-); NIH INTREPID Program
Marvins Rochemont (2024-); NIH INTREPID Program
Takerah Prince (2024-); CAHSI and NIH INTREPID Programs

Current & Recent High School Students
Ronald Xu (2016-2020); MIT Class of 2024.
Sapna Patel (2014-2018); Columbia Class of 2022, awarded Rabi Scholar.
Nikhil Patel (2013-2017); Yale Class of 2021.
Neel Patel (2009-2012); Harvard Class of 2016.

Text and Educational Books:

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

Hughes, **C. E.**, & Moshell J. M. (1984). *Imagination: Picture Programming*, John Wiley & Sons, Inc., New York.

Moshell J. M., & **Hughes**, **C. E.** (1984). *Imagination: Quilt*, John Wiley & Sons, Inc., New York.

Moshell, J. M., **Hughes C. E.** et al. (1982). *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.

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

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

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

RESEARCH

Current Research Interests (Keywords):
Affective Computing, Mixed/Virtual Reality, Virtual Learning Environments

Recent Research Recognitions
2020 Inductee, *NCS Modeling and Simulation Hall of Fame*
2018 Best Paper Award, *ACM Symposium on Spatial User Interaction (SUI 2018)*
2016 Best Paper Award, *IEEE International Conference on Serious Games and Applications for Health*
2015 Grand Challenge People's Choice Award, *International Conference on Multimodal Interaction*
2015 Publication Award from the *Teacher Education Division of the Council for Exceptional Children*
2014 Keynote speaker at ACM Multimedia 2014 EMASC-2014 Workshop
2014 TeachLivE: *2014 Learning to Teach Impact Award*
2013 TeachLivE: NTSA *Governor's Award for Outstanding Achievement in Modeling & Simulation*
2013-14 CECS Excellence in Research
2013, 2007 Research Incentive Award, 1995 Professional Excellence Program Award
2013 CECS Advisory Board Award for Faculty Excellence
2013 Dean's Research Professorship Award
2013 Invited Participant Dagstuhl Seminars – Virtual Reality
2012 UCF Fellow of the Academy for Teaching, Learning and Leadership
2012 TeachLivE Selected for AACTE *2012 Best Practice Award for Innovations in Technology*
2009 Best Paper Award, *Genetic and Evolutionary Computation Conference (GECCO 2009)*

Google Scholar Link
https://scholar.google.com/citations?user=pbb9CG4AAAAJ&hl=en

Publications: (* reflects current or former students)

Preprints (arXiv):
1. Ali, K*, & **Hughes, C. E.** (2023). A Unified Transformer-based Network for Multimodal Emotion Recognition. arXiv:2308.14160 [cs.CV]
2. Ali, K.*, Shah, S.*, & **Hughes, C.E.** (2023). In the Wild Affect Analysis of Children with ASD using Heart rate. *Preprints.org* 2023, 2023040692. https://doi.org/10.20944/preprints202304.0692.v1
3. Wang, D.*, Wang, P.*, Liu, K.*, Zhou, Y., **Hughes, C. E.**, & Fu, Y. (2022). Reinforced Imitative Graph Learning for Mobile User Profiling. *arXiv*:2203.06550 [cs.AI].
4. Ren, W*., Wang, P.*, Li, X., **Hughes, C. E.**, & Fu, Y. (2021). Semi-supervised Drifted Stream Learning with Short Lookback. *arXiv*:2205.13066 [cs.LG].
5. Ali, K.*, & **Hughes, C. E.** (2020). An Efficient Integration of Disentangled Attended Expression and Identity Features for Facial Expression Transfer and Synthesis. *arXiv:*2005.00499v1 [cs.CV].
6. Ali, K.*, & **Hughes, C. E.** (2019). Facial Expression Representation Learning by Synthesizing Expression Images. *arXiv*:1912.01456v1 [cs.CV].
7. Ali, K.*, & **Hughes, C. E.** (2019). All-In-One: Facial Expression Transfer, Editing and Recognition Using A Single Network. *arXiv*:1911.07050v1 [cs.CV].
8. Ali, K.*, Isler, I.*, & **Hughes, C. E.** (2019). Facial Expression Recognition Using Human to Animated-Character Expression Translation. *arXiv*: 1910.05595v1 [cs.CV].
9. Ali, K.*, & **Hughes, C. E.** (2019). Facial Expression Recognition Using Disentangled Adversarial Learning. *arXiv*: 1909.13135v1 [cs.CV].
10. Hamza-Lup*, F. G., Rolland, J. P., & **Hughes, C. E.** (2018). A Distributed Augmented Reality System for Medical Training and Simulation. *arXiv*:1811.12815 [cs.DC].
11. Hamza-Lup*, F. G., **Hughes, C. E.** & Rolland, J. P. (2018). Sensors in Distributed Mixed Reality. *arXiv*:1811.11955 [cs.DC].

Journals:
1. Ali, K*., & **Hughes, C. E.** (2025). A Unified Biosensor-Vision Multi-modal Transformer Network for Emotion Recognition. *Biomedical Signal Processing and Control*. 102, 107232 (11 pages), https://doi.org/10.1016/j.bspc.2024.107232. IF: 4.9
2. Ferrer, R.*, Ali, K*., & **Hughes, C.** (2024). Using AI-Based Virtual Companions to Assist Adolescents with Autism in Recognizing and Addressing Cyberbullying. *Sensors*, 24(12), 3875 (17 pages). https://doi.org/10.3390/s24123875. IF: 3.9
3. Dieker, L., Hines, R., Wilkins, I., **Hughes, C.**, Hawkins Scott, K., Smith, S., Ingraham, K., Ali, K.*, Zaugg, T.*, Shah, S.* (2024). Using an Artificial Intelligence (AI) Agent to Support Teacher Instruction and Student Learning. *Journal of Special Education Preparation*, 4(2), 78–88. https://doi.org/10.33043/d8xb94q7.
4. Dieker, L. A., **Hughes, C. E.**, & Hynes, M. (2023). The Past, the Present, and the Future of the Evolution of Mixed Reality in Teacher Education. *Education Sciences*, 13(11), 1070 (17 pages). https://doi.org/10.3390/educsci13111070. IF: 3.663
5. Ali, K*, Shah, S.*, & **Hughes, C. E.** (2023). In the Wild Affect Analysis of Children with ASD Using Heart Rate. *Sensors*, 23(14):6572. https://doi.org/10.3390/s23146572. IF: 3.9
6. Taliaferro, L. A., Westers, N. J., Matsumiya , B., Ingraham, K., Muehlenkamp , J. J., & **Hughes, C. E.** (2023). Improving Capacity to Identify, Assess, and Manage Adolescents Engaging in Non-Suicidal Self-Injury Using Patient Avatars. *Medical Teacher*. 1-7. https://doi.org/10.1080/0142159X.2023.2216861. IF: 4.7
7. Shah, S.*, Ali, K.*, Dieker, L., & **Hughes, C.** (2023). WAVE: A Web-Based Platform for Delivering Knowledge-Driven Virtual Experiences. *IEEE Computer Graphics & Applications*. 43(3), 54-60, 1 May-June 2023, https://doi.org/10.1109/MCG.2023.3260599. IF: 2.088
8. Wang, D.*, Wang, P.*, Liu, K.*, Zhou, Y., **Hughes, C. E.**, & Fu, Y. (2023). Reinforced Imitative Graph Learning for Mobile User Profiling. *IEEE Transactions on Knowledge and Data Engineering*. 1-13. https://doi.org/10.1109/TKDE.2023.3270238. IF: 9.235.

9. **Hughes, C. E.**, Dieker, L., A., Glavey, E., Hines, R., Wilkins, I., Ingraham, K., Bukaty, C., Ali, K.*, Shah, S.*, Murphy, J.*, & Taylor, M. (2022). RAISE: Robotics & AI to Improve STEM and Social Skills for Elementary School Students. *Frontiers in Virtual Reality: Virtual Reality and Human Behaviors*, https://doi.org/10.3389/frvir.2022.968312. IF: 3.2.

10. Kent, J. A.*, & **Hughes, C. E.** (2022). Law Enforcement Training using Simulation for Locally Customized Encounters. *Frontiers in Virtual Reality: Technologies for Virtual Reality*, https://doi.org/10.3389/frvir.2022.960146. IF: 3.2.

11. Hayes, A*., **Hughes, C. E.**, & Bailenson, J. (2022). Identifying and Coding Behavioral Indicators of Social Presence with a Social Presence Behavioral Coding System. *Frontiers in Virtual Reality: Virtual Reality and Human Behaviors*, 3, https://doi.org/10.3389/frvir.2022.773448. IF: 3.2.

12. Norouzi*, N., Bruder, G., Erickson*, A., Kim*, K., Bailenson, J., Wisniewski, P. J., **Hughes, C. E.**, & Welch, G. (2021). Virtual Animals as Diegetic Attention Guidance Mechanisms in 360-Degree Experiences. *IEEE Transactions on Visualization and Computer Graphics*, 27(11), 4321-4331. http://doi.org/10.1109/TVCG.2021.3106490. IF: 5.2.

13. Dieker, L. A., Straub, C., Hynes, M., **Hughes, C. E.**, Bukaty*, C., Bousfield, T.*, & Mrstik, S.* (2019). Using Virtual Rehearsal in a Simulator to Impact Performance of Science Teachers. *International Journal of Gaming and Computer-Mediated Simulations (IJGCMS)*, 11(4), 1-20. https://doi.org/10.4018/IJGCMS.2019100101. IF: 2.17

14. Barmaki, R.*, & **Hughes, C. E.** (2018). Embodiment Analytics of Practicing Teachers in a Virtual Rehearsal Environment. *Journal of Computer Assisted Learning*, 34(4), 387–396. https://doi.org/10.1111/jcal.12268. IF: 5.0.

15. Abualsamid A.*, & **Hughes C.E.** (2018). Using a Mobile App to Reduce Off-Task Behaviors in Classrooms: A Pilot Study. *Journal on Technology and Persons with Disabilities*, Vol. 6, 378-384.

16. Dieker, L. A., **Hughes, C. E.**, Hynes, M. C., & Straub, C. (2017). Using simulated virtual environments to improve teacher performance. *School University Partnerships (Journal of the National Association for Professional Development Schools): Special Issue: Technology to Enhance PDS,* 10(3), 62-81.

17. Taylor, M.*, Tucker, J., Donehower, C.*, Pabian, P., Dieker, L. A., Hynes, M. C., & **Hughes, C**. (2017). Impact of virtual simulation on the interprofessional communication skills of physical therapy students. *Journal of Physical Therapy Education*, 31(3), 83-90.

18. Wehrer, A.*, Yee, A.*, Lisle, C., & **Hughes, C. E.** (2015). PhyloPen: Phylogenetic tree browsing using a pen and touch interface. *PLOS Currents: Tree of Life*. 2015 Nov 23, Edition 1.

19. Dieker, L. A., Hynes, M. C., **Hughes, C. E**., Hardin, S.*, & Becht, K.* (2015). TLE TeachLivE (TM): Using Technology to Provide Quality Professional Development in Rural Schools. *Rural Special Education Quarterly* 34(3), 11-16. https://doi.org/10.1177/875687051503400303

20. Nagendran, A., Pillat, R.*, Kavanaugh, A.*, Welch, G., & **Hughes, C. E.** (2014). A Unified Framework for Individualized Avatar-Based Interactions. *Presence: Teleoperators and Virtual Environments*, 23(2), 109-132.

21. Dieker, L. A., Straub, C., **Hughes**, **C. E.**, Hynes M. C., & Hardin, S. E.* (2014). Learning from Virtual Students. *Educational Leadership*, 71(8), 54-58.

22. Dieker, L. A., Rodriguez, J.*, Lingnugaris-Kraft, B., Hynes, M., & **Hughes C. E.** (2014). The Potential of Simulated Environments in Teacher Education: Current Potential and Future Possibilities. *Teacher Education and Special Education*, 37(1), 21-33. **(2015 Publication Award from the Teacher Education Division of the Council for Exceptional Children)**. https://doi.org/10.1177/0888406413512683

23. Hayes, A. T.*, Straub, C. L., Dieker, L. A., **Hughes, C. E.**, & Hynes, M. C. (2013). Ludic Learning: Exploration of TLE TeachLivE™ and Effective Teacher Training. *International Journal of Gaming and Computer-Mediated Simulations*, 5(2), 2013, 23-36. DOI:10.4018/jgcms.2013040102

24. Harmon, L. J., Baumes, J., **Hughes, C**., Soberon, J., Specht, C. D., Turner, W., Lisle C., & Thacker, R. W. (2013). Arbor: Comparative Analysis Workflows for the Tree of Life. *PLOS Currents: Tree of Life*, 2013 Jun 21 [last modified: 2013 Jun 21]. Edition 1.

25. Norris, A. E., Hughes, C., Hecht, M. L., Peragallo N. P., & Nickerson, D. (2013). Randomized trial of a peer resistance skill-building game for Hispanic early adolescent girls: Impact and feasibility of DRAMA-RAMA™. *Nursing Research*, 62(1), 25-35.

26. Varcholik, P.*, LaViola, J. J., & **Hughes, C. E.** (2011). Establishing a baseline for text entry for a multi-touch virtual keyboard. *International Journal of Human-Computer Studies*, 70(10), October 2012, 657-672.

27. Walters, L. C., Hughes D. E., & **Hughes, C. E.** (2011). Interconnections: Revisiting the Future. *Game and Culture*, 6(6), 538-559.

28. Risi, S.*, **Hughes, C. E.**, & Stanley, K. O. (2010). Evolving plastic neural networks with novelty search. *Adaptive Behavior*, 18(6), 470-491.

29. Beato, N.*, Colbert, M.*, Zhang, Y.*, Yamazawa, K., & **Hughes, C. E.** (2009). Interactive Chroma-keying for Mixed Reality. *Computer Animation and Virtual Worlds*, 20(2-3), 405-415.

30. Fiore, S. M., Harrison, G. W., **Hughes, C. E.**, & Rutström, E. (2009). Virtual Experiments and Environmental Policy. *Journal of Environmental Economics and Management* 57(1), 65-86.

31. Dieker, L., Hynes, M., **Hughes, C. E.**, & Smith E. (2008). Implications of Mixed Reality and Simulation Technologies on Special Education and Teacher Preparation. *Focus on Exceptional Children*, 40(6), 1-20.

32. Colbert, M.*, Reinhard E., & **Hughes, C. E.** (2007). Painting in High Dynamic Range. *Journal of Visual Communication and Image Representation*, 18(5), 387-396.

33. Micikevicius, P., & **C. E. Hughes** (2007). Visibility-based Forest Walk-through Using Inertial Level of Detail Model. *Journal of Defense Modeling and Simulation*, 4(2), April 2007, 80-96.

34. Fidopiastis, C. M., Stapleton, C. B., Whiteside, J. D., **Hughes, C. E.**, Fiore, S. M., Martin, G. A.*, Rolland J. P., & Smith, E. M. (2006). Human Experience Modeler: Context Driven Cognitive Retraining to Facilitate Transfer of Training. *CyberPsychology and Behavior*, 9(2), 183-187.

35. Stapleton, C. B., & **Hughes, C. E.** (2006). Believing is Seeing. *IEEE Computer Graphics and Applications* 27(1), January/February 2006, 80-85.

36. Xu, R.*, Pattanaik S. N., & **Hughes, C. E.** (2005). HDR Still Image Encoding in JPEG 2000. *IEEE Computer Graphics and Applications*, 26(6), 69-76.

37. **Hughes, C. E.**, Stapleton, C. B., Hughes, D. E., & Smith, E. (2005). Mixed Reality in Education, Entertainment and Training: An Interdisciplinary Approach. *IEEE Computer Graphics and Applic*ations, 26(6), 24-30.

38. Konttinen*, J., **Hughes, C. E.,** & Pattanaik, S. N. (2005). The Future of Mixed Reality: Issues in Illumination and Shadows. *Journal of Defense Modeling and Simulation* 2(1), January 2005, 51-59.

39. Stapleton, C. B., & **Hughes, C. E.** (2003). Interactive Imagination: Tapping the Emotions through Interactive Story for Compelling Simulations. *IEEE Computer Graphics and Applications* 24(5), September/October 2003, 11-15.

40. Smith, M. L.*, Parsons R. J., & **Hughes C. E.** (2003). View-centric Reasoning for Linda and Tuple Space Computation. *IEE Proceedings-Software* 150(2), April 2003, 71-84.

41. Stapleton C. B., **Hughes, C. E.**, Moshell, J. M., Micikevicius P., & Altman, M.* (2002). Applying Mixed Reality to Entertainment. *IEEE Computer* 35(12), December 2002, 122-124.

42. **Hughes, C. E.**, Moshell, J. M., Reed, D.*, Chase, D. Z., & Chase, A. F. (2001). The Caracol Time Travel Project. *The Journal of Visualization and Computer Animation* 12(4), September 2001, 203-214.

43. Chen, J. X.*, Lobo, N., **Hughes, C. E.**, & Moshell, J. M. (1997). Real-time Fluid Simulation in a Networked Virtual Environment. *IEEE Computer Graphics and Applications* 17(3), 52-61.

44. **Hughes, C. E.**, & Moshell, J. M. (1997). Shared Virtual Worlds for Education: The ExploreNet Experiment. *Multimedia Systems*, 5(2), 145-154.

45. Burg, J.*, Lang, S. D., & **Hughes, C. E.** (1996). Intelligent Backtracking in CLP(R). *Annals of Artificial Intelligence and Mathematics* 17(3-4), 1996, 189-212.

46. Moshell, J. M., & **Hughes, C. E.** (1996). The Virtual Academy: A Simulated Environment for Constructionist Learning. *International Journal of Human-Computer Interaction* 8(1), 1996, 95-110.

47. Chen, J. X.*, Moshell, J. M., **Hughes, C. E.**, Blau, B.*, & Li, X.* (1994). Distributed Virtual Environment Real-Time Simulation Network. *Advances in Modeling and Analysis B*, 31(1), 1994, 1-7.

48. Kinsley, K.*, & **Hughes, C. E.** (1992). Analysis of a Virtual Memory Model for Maintaining Database Views. *IEEE Transactions on Software Engineering*, May 1992, 402-409.

49. Arefi, F.*, Workman, D., & **Hughes, C. E.** (1990). Automatically Generating Visual Syntax-Directed Editors. *Communications of the ACM*, 1990, 349-360.

50. Kinsley, K.*, & **Hughes, C. E.** (1988). Evaluating Database Update Schemes: A Methodology and its Applications to Distributive Systems. *IEEE Transactions on Software Engineering*, 1081-1089.

51. Petty, M. D.*, Moshell, J. M., & **Hughes, C. E.** (1988). Tactical Simulation in an Object-Oriented Animated Graphics Environment**.** *ACM SIGSIM Simulation Digest* 19(2), June 1988, 31-46**.**

52. **Hughes, C. E.**, Moshell, J. M., Lacy, L. W.*, & Lewis, R. L.* (1988). 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.

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Invention Patents, Disclosures and Trademarks:

1. Lisa Dieker, **Charles Hughes**, Michael Hynes. "TeachLivE®, Educational services, namely, providing web-based training via simulation and virtual training for certification of teachers and

continuing education for teachers and principals," 1/23/2024. Service Mark, UCF Board of Trustees listed as owner.

2. Lisa Dieker, **Charles Hughes**, Michael Hynes, "DebriefScape®, Downloadable computer software for processing therapeutic and educational instruction video session annotation files," 4/4/2023. Trademark, UCF Research Foundation listed as owner.

3. Lisa A. Dieker, Michael Hynes**, Charles E. Hughes**, Eleazar Vasquez, Kathleen Ingraham, Claire Donehower, Taylor Bousfield, "Sensory Determinative Audio Rendering," US Patent No. 11.600,190. Awarded March 7, 2023; Filed August 12, 2022. Assigned to University of Central Florida Research Foundation, Inc.

4. Lisa A. Dieker, Michael Hynes, **Charles E. Hughes**, Eleazar Vasquez, Kathleen Ingraham, Claire Donehower, Taylor Bousfield, "Therapeutic Simulator System for Stress Disorders," US Patent No. 11.600,189. Awarded March 7, 2023; Filed August 15, 2022. Assigned to University of Central Florida Research Foundation, Inc.

5. Lisa A. Dieker, Michael Hynes, **Charles E. Hughes**, Eleazar Vasquez, Kathleen Ingraham, Claire Donehower, Taylor Bousfield, "Simulation Therapy for Autism Spectrum Disorder," US Patent No. 11.600,188. Awarded March 7, 2023; Filed August 15, 2022. Assigned to University of Central Florida Research Foundation, Inc.

6. Lisa A. Dieker, Michael Hynes, **Charles E. Hughes**, Eleazar Vasquez, Kathleen Ingraham, Claire Donehower, Taylor Bousfield, "Adaptive Simulation Rendering on Sensory Load," US Patent No. 11,450,220. Awarded September 22, 2022; Filed February 14, 2022. Assigned to University of Central Florida Research Foundation, Inc.

7. Lisa A. Dieker, Michael Hynes, **Charles E. Hughes**, Eleazar Vasquez, Kathleen Ingraham, Claire Donehower, Taylor Bousfield, "Physiologic Responsive Rendering of Computer Simulation," US Patent No. 11,282,403 B2. Awarded March 22, 2022; Filed August 19, 2020. Assigned to University of Central Florida Research Foundation, Inc.

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9. Lisa A. Dieker, Michael Hynes, **Charles E. Hughes**, Eleazar Vasquez, Kathleen Ingraham, Claire Donehower, Taylor Bousfield, "Adaptive Simulation Rendering on Sensory Load," US Patent No. 17/670,668. Filed February 14, 2022, Assigned to University of Central Florida Research Foundation, Inc.

10. Eric Imperiale, Lisa A. Dieker, **Charles E. Hughes**, Kathleen Ingraham, Michael C. Hynes, "US Design Patent D895,027 S: 3-Dimensional Character," Awarded September 1, 2020; Filed May 5, 2020. Assigned to University of Central Florida Research Foundation, Inc.

11. **Charles E. Hughes**, Lisa A. Dieker, Arjun Nagendran, Michael C. Hynes, "Semi-Automated Digital Puppetry Control," US Patent No. 9,381,426 B1. Awarded July 5, 2016; Filed March 17, 2014; Provisional Application March 15, 2013. Assigned to University of Central Florida Research Foundation, Inc.

12. **Charles E. Hughes**, Tracy St. Benoit, "Culturally Adaptive Avatar Simulator," US Patent No. 9,690,784 B1. Awarded June 27, 2017; Filed March 17, 2014; Provisional Application March 15, 2013. Assigned to University of Central Florida Research Foundation, Inc.

13. Nicholas Beato, **Charles E. Hughes**, Mark Colbert, Yunjun Zhang, Kazumasa Yamazawa, "Real-time Chromakey Matting Using Image Statistics," Awarded July 2, 2013. US Patent No. 8,477,149 B2.

14. Lisa Dieker, **Charles Hughes**, Michael Hynes, TLE TeachLivE™, Educational services, namely, providing web based and classroom training for certification of teachers and continuing education for teachers and principals, 8/19/2011. Service Mark, UCF listed as owner.

External Research Grants and Contracts (PI underlined):

Active – Awarded: $6,421,634; Credit: $1,541,487

National Institute on Aging (NIH/NIA), *Investigators from Novices, a Transdisciplinary Research Education Program to Increase Diversity (INTREPID) in Aging Research*, $1,787,999 (3%

credit=$53,640), (PI: N. Conner, H. Huang, **C. E. Hughes**, et al.). This is awarded incrementally with Years 1 and 2 funded at this point. 5/17/2023-1/31/2028

University of Kansas, Flight STEM Coaching, $749,845 (24% credit=$179,809), (PI: R. Hines, **C. E. Hughes**). 01/17/2024-09/30/2026. This replaces the *DebriefScape* Department of Ed grant.

US Department of Education, *Enhancing the Impact of Modeling and Simulation Education for the 21st Century Workforce*, $1,443,690 (33% credit=$480,749), (PI: R. Azevedo, G. Bochenek. **C. E. Hughes**). 12/31/2021-12/31/2024.

National Science Foundation via the University of Texas at El Paso, *BPC-AE: An Extended CAHSI Alliance to Broaden Participation in Graduate Studies*, $139,483 (33% credit=$44,871), (PI: G. Leavens, **C. E. Hughes**). 11/30/2021-11/29/2025.

US Department of Education via UCP of Central Florida, *PROJECT RAISE: Robots and Artificial Intelligence to Improve Social Skills for Elementary Students*, $997,746 (33% credit=$332,230), (PI: Lisa Dieker, R. Hines, **C. E. Hughes**). 01/01/2021-12/31/2025. This is awarded incrementally with Years 1 through 4 funded and Year 5 pre-approved.

US Department of Education, *DebriefScape™ Suite: Personalized Dashboard and Open Education Resources for STEM Coaches to Support Special Education Teachers*, First two years $986,784 (25% credit=$246,696), (PI: L. Dieker, R. Hines, **C. E. Hughes**, Eleazar Vasquez). 10/01/2021-09/30/2026. This is awarded incrementally with Years 1 and 2 funded at UCF and Years 3 through 5 funded through a subaward from the University of Kansas (see above).

National Science Foundation, *EAGER: SaTC-EDU: Improving Cybersecurity Education for Adolescents with Autism Through Automated Augmented Self-Monitoring Applications*, $299,987 (62.5% credit=$187,492), (PI: **C. E. Hughes**, L. Dieker). 05/01/2021-04/30/2025 *REU Supplement*, $16,000 (100% credit=$16,000), (PI: **C. E. Hughes**). 08/02/2023-04/30/2025.

Completed – Awarded and Completed since 2000: $23,065,616; Credit since 2000: $7,034,640

National Science Foundation, *Simulated Practice: Using Socially-Responsive Avatars to Prepare STEM GTAs for Student-Centered Instruction*, $700,009 (30% credit=$210,003), (PI: J. Chini, **C. E. Hughes**, E Saitta). 11/15/2017-10/31/2024.

National Science Foundation, *Collaborative Research: CCRI: Planning: InfraStructure for Photorealistic Image and Environment Synthesis (I-SPIES)*, $77,922 (10% credit=$7.792), (PI: Ryan McMahan, **C. E. Hughes**, Lori Walters). 10/01/2021-09/30/2023.

Orlando Health Foundation, *Student Support*, $118,268 (100% credit=$118,268), (PI: **C. E. Hughes**, P Wiegand). 06/24/2019-12/31/2022.

Walt Disney Attractions, *Lifelong Learning Program: A New Paradigm in STEM and Business Workforce Development*, $398,000 (40% credit=$159,200), (PIs: I. Garibay, **C. E. Hughes**). 1/7/2019-4/30/2020.

National Science Foundation via University of Idaho, *Arbor: Comparative Analysis Workflows for Tree of Life*, $290,461 (100% credit=$290,461), (PI: **C. E. Hughes**). 5/1/2012-4/30/2019.

Walt Disney Attractions, *Lifelong Learning Program: Deep Learning Intrapreneurship Pilot*, (PIs: I. Garibay, **C. E. Hughes**). $397,479 (40% credit=$158,992), 1/1/2018-12/31/2018.

Office of Naval Research, *DURIP: Transportable Human-Surrogate Interaction System (THuSIS)*, $148,216 (16.7% credit=$24,752), (PIs: G. Welch, **C. E. Hughes**, A. Raij). 09/15/2016-09/14/2018.

Office of Naval Research, *Human Surrogate Interaction*, (PIs: Greg Welch, **C. E. Hughes**). $2,312,188 (20% credit=$462,438), 3/1/2014-2/28/2017.

Carnegie Mellon University, *Towards Automatic Understanding and Recognition of Curiosity in Children*. $10,591 (100% credit=$10,591) (PI: **C. E. Hughes**). 8/22/2016-5/2/2017.

Bert W. Martin Foundation, *TeachLivE™ elementary classroom*, $124,000 (33% credit=$41,333), (PIs: L. Dieker, M. Hynes, **C. E. Hughes**). 4/1/2016-3/31/2017.

Bill & Melinda Gates Foundation, *TeachLivE^{TM}*, $1,500,055 (33% credit=$500,018), (PIs: L. Dieker, M. Hynes, **C. E. Hughes**). 4/1/2012-6/30/2016.

Bert W. Martin Foundation, *TeachLivE™ Avatar Proposal for an elementary classroom and student with autism*, $65,000 (33% credit=$21,666), (PIs: L. Dieker, M. Hynes, **C. E. Hughes**). 4/1/2015-3/31/2016.

National Science Foundation, *Reducing Alcohol Use among College Students Using Digital Puppetry*, $257,721 (75% credit=$193,291), (PIs: **C. E. Hughes**, Tom Hall), joint with Weill Cornell College of Medicine. 9/1/2011-12/31/2015.

National Science Foundation via University of Illinois, *Meteor Year 3*, $177,808 (35% credit=$62,233), (PIs: E. Smith, **C. E. Hughes**). 9/1/2013-8/31/2015.

Bert W. Martin Foundation, *TeachLivE™ Avatar Proposal for a student with autism and a student with intellectual disabilities*, $40,000 (33% credit=$13,333), (PIs: L. Dieker, M. Hynes, **C. E. Hughes**).3/16/2014-3/15/2015.

Office of Naval Research, *3D Display and Capture of Humans for Live Virtual Training*, (PIs: Greg Welch, **C. E. Hughes**). $1,316,334 (20% credit=$263,223), (PIs: Greg Welch, **C. E. Hughes**). 10/1/2011-9/30/2014.

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). $1,476,967 (20% credit = $295,393), 9/1/2009-8/31/2014.

Office of Naval Research, *DURIP: A Physical-Virtual Human-Robot Interaction System for Training, Education and Rehabilitation*, $268,598 (20% credit=$53,720), (PIs: Greg Welch, **C. E. Hughes**, Arjun Nagendran). 7/10/2012-7/31/2014.

National Endowment for the Humanities, *Journey beyond the Fairs*, $49,715 (30% credit - $14,915), (PIs: L. Walters, **C. E. Hughes**, D. Hughes). 5/1/2011-4/30/2014.

National Science Foundation, *Metaphor-Based Learning of Physics Concepts through Whole-Body Interaction in a Mixed Reality Science Center Exhibit*, (PIs: R. Lindgren, **C. E. Hughes**, J. M. Moshell, E. Smith, S. Gallagher). $963,359 (20% credit = $192,674). 9/1/2011-8/31/2014.

NewSchools Venture Fund, *TeachLivE^{TM}*, $189,878, (33% credit=$63,293), (PIs: M. Hynes, **C. E. Hughes**, L. Dieker). 6/15/2013-9/30/2013.

Army PEO-STRI via Cole Engineering Services, *Joint Urban Capabilities Design*, $84,376, (50% credit=$42,188), (PIs: **C. E. Hughes**, Lori Walters), 6/26/2013- 9/30/2013.

U.S. Department of Veterans Affairs, *Intergovernmental Personnel Act Agreement for Charles Hughes*, $63,342, (100% credit=$63,342), (PI: C. E. Hughes), 9/24/2012-9/23/2013.

National Science Foundation, *EAGER: Efficient control and transmission of digital puppetry*, $199,754, (100% credit=$199,754), (PIs: **C. E. Hughes**), 9/01/2010-8/31/2013.

National Science Foundation, *EAGER: Efficient control and transmission of digital puppetry*, $20,000, (50% credit=$10,000), (PIs: **C. E. Hughes**, M. Tappen). 9/01/2010-8/31/2013.

Bill & Melinda Gates Foundation, *TeachLivE^{TM}*, (PIs: L. Dieker, M. Hynes, **C. E. Hughes**), $103,000 (33% credit = $34,333). 7/1/2011-6/30/2013.

National Institutes of Health, *ARRA: Using Mixed Reality to Build Peer Resistance Skills in Latina Middle Schoolers*, $434,812 (40% credit = $173,925). (PIs: Anne Norris, **C. E. Hughes**, D. Nickerson). 3/15/2010-2/28/2013.

National Science Foundation, *Water's Journey through the Everglades*, (PIs: E. Smith, **C. E. Hughes**, L. Walters, K. Kitalong, M. Johnson), $3,029,353 (40% credit = $1,211,741), Role: co-PI). 5/15/2007-7/31/2012.

Army RDECOM, *Mixed Reality Immersion Research*, (PIs: E. Smith, **C. E. Hughes**). $224,880. 6/8/2010-6/30/2011. (50% credit = $112,440; Role: co-PI).

West Virginia University, *TeachME Classroom Sessions and Software Program Services*, (PIs: L. Dieker, **C. E. Hughes**, M. Hynes). $7,998 (33% credit = $2,639), 9/1/2010-3/31/2011.

Old Dominion University Research Foundation, *TeachME*, (PIs: L. Dieker, **C. E. Hughes**, M. Hynes, $7,998 (25% credit = $2,000), 7/1/2010-3/31/2011. (25% credit = $2,000; Role: co-PI).

University of Wisconsin Milwaukee, *TeachME Classroom Sessions and Software Program Agreement*, (PIs: L. Dieker, **C. E. Hughes**, M. Hynes), $4,000, (25% credit = $1,000), 11/1/2010-3/31/2011.

University Center of Greenville, *TeachME Classroom Sessions and Software Program*, (PIs: L. Dieker, **C. E. Hughes**, M. Hynes), $25,000 (33% credit = $8,250), 11/1/2010-3/31/2011.

Utah State University, *TeachME*, $20,521 (50% credit=$10,261), (PIs: **C. E. Hughes**, E. Smith), 2009-2010.

National Science Foundation, *DRU: Cognition in Natural Environments: Using Simulated Scenarios in Complex Decision-Making Experiments*, $647,430, (20% credit=$129,486), (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*, $199,628 (50% credit=$99,814), (UCF PIs: **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*, $99,814 (50% credit=$49,907), (PIs: **C. E. Hughes**, E. Smith), 2007- 2010.

National Science Foundation, *GRA VRMC Fellowship*, $15,540 (50% credit=$7,770), (UCF PIs: **C. E. Hughes**, E. Smith), 2007-2010.

National Science Foundation, *STTR Phase I: Developing a Mixed Reality Rehabilitation System*, $61,581 (50% credit=$30,791), (UCF PIs: **C. E. Hughes**, E. Smith), joint with Virtual Reality Medical Center, 2007.

I4 High Tech Corridor, *Developing a Mixed Reality Rehabilitation System for Stroke Victims*, $30,290 (50% credit=$15,145), (PIs: **C. E. Hughes**, E. Smith), 2007- 2010.

Army RDECOM via IST, *MR MOUT Revitalization*, $200,000 (35% credit-$70,000), (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*, $2,137,500 (5% credit=$106,875), (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*, $29,989 (33% credit=$9,896), (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*, $32,757, (20% credit=$6551), (UCF PIs: **C. E. Hughes**, C. Fidopiastis, Fiore, S., D. Hughes, D. Mapes, E. Smith), joint with Virtual Reality Medical Center, 2007-2008.

Army RDE Command, *Evaluating the Impact of Mixed Reality on Human Performance and Interaction with Adolescents and Young Adults*, $173,900 (40% credit=$69,560), (PIs: **C. E. Hughes**, E. Smith, C. Stapleton), 2007.

Department of Education, *SBIR Phase I: The Virtual STAR Classroom Simulator*, $32,940 (50% credit = $16470), (UCF PIs: E. Smith, **C. E. Hughes**), subcontract from Simiosys LLC, 2006.

Army Research Institute, *ARI Virtual Environment Research Testbed*, $240,000 (8.7% credit=$21,000), (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*, $350,220 (30% credit: $105,066), (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*, $221,000 (54% Credit=$119,340), (PIs: **C. E. Hughes**, B. Goldiez, S. Teicher), 2003-2005.

Office of Naval Research, *Research in Augmented and Virtual Environment Systems: Rendering*, $196,445 (31% credit=$60,898), (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*, $235,734 (11% credit=$25,932), (PIs: <u>C. B. Stapleton</u>, **C. E. Hughes**), 2003-2005.

Office of Naval Research, *Research in Augmented and Virtual Environment Systems: Battlefield Augmented Reality System*, $343,779 (46% Credit=$158,138), (PIs: <u>B. Goldiez</u>, **C. E. Hughes**, C. B. Stapleton, K. Garfield), 2003-2005.

Office of Naval Research, *Research in Augmented and Virtual Environment Systems*, $235,734 (11% credit=$25,932), (PIs: <u>C. Stapleton</u>, **C. E. Hughes**, J. M. Moshell), 2003-2005.

Army RDE Command, *Part 1: The Enhancement of MOUT Training with Mixed Reality and Theme Park Technology (CLIN003)*, $190,000 (33% credit=$62,700), (PIs: <u>C. Stapleton</u>, **C. E. Hughes**, J. M. Moshell), 2001-2004.

Army RDE Command, *Part 1: The Enhancement of MOUT Training with Mixed Reality and Theme Park Technology*, $59,290 (25% credit=$14,823), (PIs: <u>C. Stapleton</u>, **C. E. Hughes**, J. M. Moshell), 2001-2004.

Army RDE Command, *MR MOUT III: The Enhancement of MOUT Training with Mixed Reality and Theme Park Technology*, $271,888 (40% credit=$108,755), (PIs: <u>C. Stapleton</u>, **C. E. Hughes**, J. M. Moshell), 2001-2005.

Association to Preserve Eatonville Community, *Carol Mundy Digital Archive Prototype Project*, $32,000 (50% credit=$16,000), (PIs: <u>**C. E. Hughes**</u>, J. M. Moshell), 2003-2004.

Silicon Graphics, *OpenIR Development*, $40,000 (50% credit=$20,000), (PIs: <u>J. M. Moshell</u>, **C. E. Hughes**), 2003.

Canon Mixed Reality Labs, *Mixed Reality Infotainment*, $200,000 (32% credit=$64,000), (PIs: <u>C. Stapleton</u>, **C. E. Hughes**, J. M. Moshell, C. Ford), 2003.

Canon Mixed Reality Labs, *MR Canon IAAPA*, $199,422 (32% credit=$63,815), (PIs: <u>C. Stapleton</u>, **C. E. Hughes**, J. M. Moshell), 2002.

Canon Mixed Reality Labs, *Mixed Reality Tests for Nickelodeon Studios*, $50,578 (33% credit=$16,691), (PIs: <u>C. Stapleton</u>, **C. E. Hughes**, J. M. Moshell), 2002.

Army STRICOM, *The Enhancement of Training in Virtual and Mixed Reality Environments with Realistic Vegetation*, $149,789 (45% credit=$67,405), (PIs: <u>**C. E. Hughes**</u>, J. M. Moshell, V. Sims, J. Weishampel), 2002-2003.

Army STRICOM, *Populating a MOUT Facility with Spatially Registered Features: The Virtual Backlot*, $116,000 (35% credit=$40,600), (PIs: <u>**C. E. Hughes**</u>, J. M. Moshell, C. Stapleton, A. Cortes), 2002-2003.

Army STRICOM, *Tracking Systems for Multiplayer Mixed Reality*, $75,000 (30% credit=$22,500) (PIs: <u>C. Stapleton</u>, **C. E. Hughes**, J. M. Moshell, A. Cortes), 2002-2003.

Army STRICOM, *Virtual Object Rendering and Registration for Mixed Reality MOUT*, $96,000 (20% credit=$19,200), (PIs: <u>J. M. Moshell</u>, Cortes, A., **C. E. Hughes**, C. Stapleton, S. Pattanaik, J. Malala), 2002-2003.

National Science Foundation, *Augmented Reality and Interactive Distributed Physical Modeling*, $176,928 (33% credit=$58,386), (PIs: <u>J. Rolland</u>, **C. E. Hughes**, R. Parsons), 2000-2003.

Army STRICOM, *Automatic Construction and Evaluation of Efficient Databases for Virtual Simulation from SEDRIS Data*, $222,566 (50% credit=$111,283), (PIs: <u>J. M. Moshell</u>, **C. E. Hughes**, A. Cortes, V. Sims, G. Schiavone), 2000-2002.

Orlando Science Center, *Measure Me - An Interactive Exhibit*, $34,857 (50% credit=$17,429), (PIs: <u>J. M. Moshell</u>, **C. E. Hughes**, C. Stapleton), 2000-2002.

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

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

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

National Science Foundation, *Undergraduate Parallel Processing*, $589,690, (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*, $94,961, (PIs: T. Frederick, **C. E. Hughes**, R. Guha and A. Mukherjee), 1982.

National Science Foundation, *High School Microcomputer Science Education*, $245,280, (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*, $23,700, (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*, $23,700, (PIs: **C. E. Hughes**, C. P. Pfleeger), NSF Grant #SED76-14494, 1976-1978.

Recent Internal Grants:

UCF Internal, P3 award for Kamran Ali, $55,000 (PI: **C. E. Hughes**), 4/18/2022-4/18/2024.

UCF Internal, IR2: Exploratory Effort Aimed at a Center for Virtual and Augmented Reality for Healthcare, $40,000 (PI: G. Welch, M. Anderson, J. Cendan, G. Bruder, C. Cruz-Neira, L. Dieker, **C. E. Hughes**, B. Noel), 1/1/2020-2/28/2022.

Current and Recent Professional Service:
Societies, Journals and Conferences
IEEE VR Program Committee, 2011-2015, 2017-present
IEEE SEGAH 2017 Program Committee, 2016-present
ISMAR 2022, First Workshop on Photorealistic Image and Environment Synthesis for Mixed Reality (PIES-MR) Co-Chair with Ryan McMahan and Jeanine Stefanucci. 2022 *IEEE International Symposium on Mixed and Augmented Reality* Adjunct (ISMAR-Adjunct) 191-221.
Virtual Reality (Springer Nature), Editorial Board, 2021-
Frontiers in Virtual Reality, Editorial Board of Virtual Reality in Industry 2020-
IEEE VR 2016 Best Paper and Best Demo Selection Committee, Member
Entertainment Computing, Associate Editor, 2011-
IEEE VR 2013 Research Demos Committee, Co-Chair
HCII Program Committee, 2008-
Journal of Cybertherapy and Rehabilitation, Member of Scientific Board, 2009-
ISMAR 2010 Program Committee (Science and Arts&Humanities reviewer), 2009-2010
ISMAR 2009 Tutorial Co-Chair, 2009
Eurographics 2008 Short Papers Program Committee, 2007-2008
International Conference on Information and Knowledge Sharing Program Committee, 2002-2006

Reviewer for *ACM Transaction of Applied Perception*, *Transactions on Computer-Human Interaction*, *IEEE CG&A*, *IEEE VR*, *PLOS ONE*, *International Journal of Human-Computer Studies*, *Entertainment Computing*, *Virtual Reality*, *Journal of Cybertherapy and Rehabilitation*, *Advances in Computer Entertainment Technology*, *Association for the Advancement of Artificial Intelligence (AAAI)*, *ACM Conference on Human Factors in Computing Systems (CHI)* , *ACM Spatial User Interaction (SUI),*, *ACM Virtual Reality Software and Technology (VRST)*, *Eurographics Symposium on Rendering (EGSR)*, *IEEE International Symposium on Mixed and Augmented Reality(ISMAR)* *International Conference on Digital Media and Digital Content Management. Various Frontiers Journals*

UCF Computer Science

Computer Science Promotion & Tenure Committee, Chair, 2017-2018; member 1980-
Computer Science Division Executive Committee, 2011-2015
Computer Science Graduate Committee, 1980-1990, 2003-2006, 2010-2015
Computer Science Division Instructor Search Committee, 2012
EECS 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 School of Modeling, Simulation & Training (SMST)/College of Graduate Studies (CGS)

Interim Director, SMST Graduate Programs 2020-2022
SMST Promotion & Tenure Committee, Chair, 2021-2022
CGS Excellence in Research Committee, Chair, 2021
RIA Awards Committee, Chair, 2021
TIP Awards Committee, Member, 2021
SMST Curriculum Committee, Chair 2020-2022
SMST P&T Committee, Chair, 2017-2019/2021, Member 2017-
SMST Program Director Search Committee, Member, 2018-2019
Faculty Search Committee for M&S Program, Member, 2015-2019
Research Professor Search Committees, Member, 2013-2015
Synthetic Reality Laboratory, Founding and Co-Director 2010-
Media Convergence Laboratory, Chief Scientist, 2001-2010; Director, 2006-2010
Research Associate Search Committee, 2006-2007
SMST Graduate Program Faculty Member, 2004-
IST Contributing Faculty, 1982-

UCF College of Engineering and Computer Science

RIA Selection Committee, Chair, 2009-2011, 2016-2020, Member, 2021
AECR Research Committee, Member, 2018-2021
50th Anniversary Committee, Member, 2018
TIP Awards Committee, Chair, 2006, 2016-2017, Member, 2018
CECS Provost Professor Search Committee, Member 2013-2014
CECS Research Committee, Member, 2011-2013
In-House Research Committee, Chair, 2010, 2011, 2012
Bioengineering Minor Admission Committee, 2009-2018
Graduate Program Coordinators Committee, Member, 2003-2007
I2Labs Fellowship Selection Committee, Member, 2005-2007
I2Lab Steering Committee, Member 2006-2007

Civil and Environmental Engineering Chair Search Committee, Chair, 2004-2005
Director of Development Search Committee, Member 2001
ABET Accreditation Committee, Member, 2000

UCF College of Community Innovation and Education

Co-Founder and Member, Center for Research in Education Simulation, 2018-
Co-PI, TeachLivE Project, 2006-
Postdoc Search Committee, 2021
College of Education TeachLivE Research Director Search Committee, 2017
Provost Faculty Cluster Research Proposal Evaluation Committee, 2014-2015
College of Education Interactor Search Committee, 2014
College of Education Director of Research for Gates Grant, 2013

UCF Nicholson School of Communication and Media

Games and Interactive Media GaIM Promotion and Tenure Committee, Member, 2019-
GaIM Digital Media Graduate Program Committee, Member, 2020-

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

SVAD Promotion and Tenure Committee, Member, 2005-2018
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)

Co-Founder and Co-Lead, Learning Sciences Faculty Cluster 2017-
Disability, Aging and Technology Cluster, Member, 2020-
College of Graduate Studies Research Professor Promotion Committee, Chair, 2021
Learning Science Faculty Cluster Search Committee, Chair, 2017-2020
Marchioli Collective Awards Committee, 2017-2020
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
University 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

Selected Recognitions and Awards:

Pegasus Professor (top university recognition), 2007-present
Modeling & Simulation Hall of Fame, 2020 Inductee
National Academy of Inventors, 2018 Inductee.
UCF Grand Marshall and Faculty Representative, Spring 2021 Graduation of College of Graduate Studies
UCF Grand Marshall, Fall 2019 Graduation of College of Engineering & Computer Science
Senior Life Member, Institute of Electrical and Electronics Engineers (IEEE) & IEEE Computer Society
Senior Life Member, Association for Computing Machinery (ACM)
ACM SIGGRAPH Computer Graphics Pioneer
UCF Teaching Incentive Award, 2015, 2009, 2002, 1985
TeachLivE Selected by New Schools Summit for *2014 Learning to Teach Impact Award*
2014 CECS Excellence in Research, UCF College of Engineering and Computer Science
UCF Research Incentive Award, 2013, 2007, 1995 (under Professional Excellence Program Award)
2013 CECS Advisory Board Award for Faculty Excellence.
2013 Dean's Research Professorship Award

TeachLivE Selected by National Simulation & Training Association (NTSA) for *2013 Governor's Award for Excellence in Modeling and Simulation*

TeachLivE Selected by National Simulation & Training Association (NTSA) for *2013 Excellence in Modeling and Simulation (Training Category)*

2012 UCF Fellow of the Academy for Teaching, Learning and Leadership

TeachLivE Selected for Honorable Mention Winner of National Consortium for Continuous Improvement in Higher Education (NCCI) *2012 Leveraging Excellence Award*.

TeachLivE Selected by American Association of Colleges of Teacher Education for *2012 Best Practice Award for Innovations in Technology*

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