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## RESEARCH INTERESTS

Human-computer interaction, virtual reality, interactive visualization, and video game design.

## EDUCATION

### ***Doctor of Philosophy in Computer Science***

Electronic Visualization Laboratory (EVL) and Computer Science, University of Illinois at Chicago (UIC), Chicago, IL (August 2014 – Present)

### ***Master of Science in Computer Science***

EVL and Computer Science, UIC, Chicago, IL (August 2010 – May 2014)

- Thesis: Multi-User Interface for Scalable Resolution Touch Walls
  - This study explores the user interface design and interaction techniques to support multiple simultaneous users interacting on large resolution shared touch walls. A user experience study evaluated different layouts and interaction behaviors of this touch-centric interface.

### ***Bachelor of Science in Computer Science***

Computer Science, UIC, Chicago, IL (August 2005 – May 2010)

## PROFESSIONAL EXPERIENCE

### ***Research Assistant, EVL, UIC (May 2010 – Present)***

- **Hummingbird – Lead Programmer/Technical Director/Supporting Actor (2019-present)**
  - Unity3D, C#, Multiple networked Quest/Quest2 HMDs, VRTK, Custom .net Sockets, Blender, Kinect2 facial scanning, Virtual Reality (HMD)
  - Multi-user virtual reality theatrical performance lead by a live actor presented at UIC/EVL as part of the Chicago Goodman Theatre's New Stages Festival and SIGGRAPH 2022's Immersive Pavilion.
  - Designed the virtual environments in Unity using assets from the Unity Asset Store along with custom models created or modified in Blender.
  - Designed numerous interactions using C# scripting and VRTK.
  - Worked directly with the playwright to best adapt an original story for virtual reality.
- **SIMPLE – Lead Programmer (2016-2018)**
  - C++, OmegaLib, Python, Unity3D, C#, Data Filtering/Parsing, Custom GLSL Shaders, Virtual Reality (CAVE2)
  - Sub-ice Investigation of Marine and Planetary-analog Ecosystems
  - Designed an interactive virtual reality visualization tool for the CAVE2™ Hybrid Reality Environment and virtual reality HMDs using Omegalib and Unity.
  - NASA funded project to visualize biogeochemical data collected by an autonomous underwater vehicle (AUV) from the ice-covered lakes of Antarctica to improve future mapping missions to Europa, one of Jupiter's ice covered moons.
- **Omicron – Lead Developer (2011-present)**
  - C++, API/SDK integration, Various Input Devices, C++/Java/C# networking sockets
  - An open-source input abstraction C++ library testbed for the seamless integration of

various novel input devices for multi-user, multi-touch, 3D hand gesturing, head tracking, body tracking and mobile and tablet devices – that works with various EVL-developed visualization and virtual-reality display systems. Specifically, I integrated various APIs, such as PQLabs, VRPN, DirectInput, and Kinect for Windows SDK to add support for multi-touch, Xbox controllers, Wii remote, and Vicon and Kinect motion trackers.

- EVL's OmegaLib, an open-source API that provides the software environment/toolkit to develop virtual-reality applications for the CAVE2™ Hybrid Reality Environment;
- EVL's SAGE™ (Scalable Adaptive Graphics Environment) middleware that provides a common operating environment, or framework, to access, display and share data-intensive 2D/3D multimedia content, such as images, video, and PDFs, on tiled-display walls; and,
- EVL's next-generation SAGE2™, an open-source, browser-based framework to access, display and share data-intensive 2D/3D multimedia content on tiled-display walls.
- **Hearts and Minds: The Interrogations Project – Lead Programmer (2014-2017)**
  - Unity3D, C#, Blender, Virtual Reality (CAVE2/HMD), Android, iOS
  - A virtual reality art experience telling the story of American soldiers who fought in the Afghanistan and Iraq wars in the 2000s who witnesses and were involved in act of torture against detainees. A collaborative project with an artist, director, and writer from multiple universities. Designed as a performance piece for the CAVE2™ Hybrid Reality Environment and later ported to VR HMDs and mobile (Android/iOS).
- **Continuum Smart Classroom – Major Contributor (2018-present)**
  - Mocap, C++, Node.js, Multi-touch
  - Designed the initial specification and layout of the 29 Opti-Track camera system for the EVL's Continuum smart classroom environment.
- **CAVE2 – Lead Developer/Technical Specialist (2012-present)**
  - Virtual Reality, C++, Python, OpenSceneGraph, OpenGL, Unity3D, C#, Vicon Cameras, C++/C# Networking Sockets, PS3/Wii/Xbox360 controllers, Kinect 2 skeleton/voice recognition
  - Designing and implementing real-time 3D interactive applications and middleware for the CAVE2™ Hybrid Reality Environment using OmegaLib (mentioned above) and Unity.
  - Maintained and performed the initial specification and layout of the 18 camera Vicon tracking system.
  - Created and maintains the developer API and tutorials used by both non-technical design students and technical CS students to create CAVE2 VR projects from 2016 to present.
- **ENDURANCE – Contributing Developer (2013-2016)**
  - C++, OmegaLib, Python, Data Filtering/Parsing, Virtual Reality (CAVE2)
  - Designed an interactive visualization and data filtering tool for the NASA funded Environmentally Non-Disturbing Underwater Robotic ANTArctic Explorer (ENDURANCE).
- **20-foot Virtual Canvas – Lead Developer (2010)**
  - Supervised three undergraduate students to develop the application. The application allows users to “paint” on a 20-foot-wide touch wall using an iPad to select and mix the colors that appear on the wall.
  - Honorable Mention in the UIC's Image of Research 2011, an annual interdisciplinary exhibit competition to showcase the breadth and diversity of research at UIC.

***Lead Programmer, MurderPunch Productions (January 2016 – July 2018)***

- Lead programmer for an independent game development studio. Developed Unity3D and GameMaker Studio games for Android and iOS.
  - Pixels: Test Your Memory (Launch title for Red Bull Mind Games)
  - Shear Madness

**Virtual Reality Consultant, School of the Art Institute of Chicago (September 2016 – October 2016)**

- Designed the specifications and installed the Vicon camera setup for a classroom virtual reality wall and performed the initial calibration, software integration with MiddleVR, Unity, and trained facility and staff on usage and maintenance.

**Research Experience for Undergraduates Assistantship, EVL, UIC (May 2009 – May 2010)**

- Developed system software for OmegaDesk, an EVL-developed workstation consisting of two active-stereo 3D displays and a PQLabs' multi-touch overlay. Specifically, I developed a TCP/UDP server to stream multi-touch data from the PQLabs touch overlay to Processing, Unity3d, and C++ applications.
- Developed applications for TacTile, an EVL-developed multi-touch table, to explore different user interface designs and layouts that make use of a multi-touch, multi-user, table-top environment. "Fleet Commander" on TacTile, see video under "Publications," is an example of one of these applications (which I subsequently ported to EVL's large tiled-display wall).

## TECHNICAL SKILLS

### Programming Languages

- C#, C++, Python, Java, JavaScript

### Video Game Engines

- Unity, Unreal, GameMaker

### Modeling Tools

- Blender, 3DS Max, SketchUp, Revit

### Virtual Reality / Motion Capture Tools

- Oculus Rift, HTC Vive, Oculus Quest 1 and 2, HoloLens 1 and 2
- VRTK, MiddleVR, Vicon, Opti-Track, VRPN, trackD, getReal3D

### Other

- Visual Studio, Node.js, Git, PlasticSCM, Perforce, Audacity, DaVinci Resolve

## TEACHING EXPERIENCE

**Computer Science, University of Illinois at Chicago, Chicago, IL (Spring 2013)**

Teaching Assistant for "Video Game Design and Development" (with Dr. Jason Leigh)

- Managed teleconferencing equipment for lectures
- Conducted lecture on "Introduction to Unity"
- Provided guidance on class projects involving Unity and Blender

**Computer Science, University of Illinois at Chicago, Chicago, IL (Fall 2012)**

Teaching Assistant for "Visualization and Visual Analytics I" (with Dr. Andrew Johnson)

- Graded projects
- Provided guidance on class project involving Processing and multi-touch walls

## PUBLICATIONS

Tsoupikova, D., Cattell, J., Johnson, A., Nishimoto, A., Jyothula, S.P., Long, L., Shum, S., 2022. *Hummingbird: Collaborative Interactive Adventure Bridging Live Theater and VR. SIGGRAPH 2022 Immersive Pavilion* (Vancouver, BC, Canada, Aug. 7-11, 2022). DOI: <https://doi.org/10.1145/3532834.3536213>

Coover, R., Rettberg, S., Tsoupikova, D. and Nishimoto, A., 2021. Addressing Torture in Iraq through Critical Digital Media. *Electronic Literature as Digital Humanities: Contexts, Forms, and Practices*, p.323.

Thielbar, K.O., Triandafilou, K.M., Barry, A.J., Yuan, N., Nishimoto, A., Johnson, J., Stoykov, M.E., Tsoupikova, D. and Kamper, D.G., 2020. Home-based upper extremity stroke therapy using a multiuser virtual reality environment: a randomized trial. *Archives of physical medicine and rehabilitation*, 101(2), pp.196-203. DOI: <https://doi.org/10.1016/j.apmr.2019.10.182>.

Nishimoto, A. and Johnson, A.E. 2019. Extending Virtual Reality Display Wall Environments Using Augmented Reality. *Symposium on Spatial User Interaction on - SUI '19* (New Orleans, LA, USA, Oct. 2019), 1–5. DOI: <https://doi.org/10.1145/3357251.3357579>

Alsaiani, A., Johnson, A. and Nishimoto, A., 2019, October. PolyVis: Cross-Device Framework for Collaborative Visual Data Analysis. In 2019 *IEEE International Conference on Systems, Man and Cybernetics (SMC)* (pp. 2870-2876). DOI: <https://doi.org/10.1109/SMC.2019.8914209>

Leigh, J., Kobayashi, D., Kirshenbaum, N., Wooton, T., Gonzalez, A., Renambot, L., Johnson, A., Brown, M., Burks, A., Bharadwaj, K. and Nishimoto, A., 2019, September. Usage patterns of wideband display environments in e-science research, development and training. In 2019 *15th International Conference on eScience (eScience)* (pp. 301-310). DOI: <https://doi.org/10.1109/eScience.2019.00041>

Tsoupikova, D., Rettberg, S., Coover, R. and Nishimoto, A. 2016. The Battle for Hearts and Minds: Interrogation and Torture in the Age of War: An Adaptation for Oculus Rift. *SIGGRAPH ASIA 2016 VR Showcase* (New York, NY, USA, 2016), 5:1–5:2. DOI: <https://doi.org/10.1145/2996376.2996383>

Nishimoto, A., Tsoupikova, D., Rettberg, S. and Coover, R. 2016. From CAVE2TM to Mobile: Adaptation of Hearts and Minds Virtual Reality Project Interaction. *Human-Computer Interaction. Interaction Platforms and Techniques*. M. Kurosu, ed. Springer International Publishing. 400–411. DOI: [https://doi.org/10.1007/978-3-319-39516-6\\_38](https://doi.org/10.1007/978-3-319-39516-6_38)

Renambot, L., Marrinan, T., Aurisano, J., Nishimoto, A., Mateevitsi, V., Bharadwaj, K., Long, L., Johnson, A., Brown, M. and Leigh, J. 2016. SAGE2: A collaboration portal for scalable resolution displays. *Future Generation Computer Systems*. 54, (Jan. 2016), 296–305. DOI: <https://doi.org/10.1016/j.future.2015.05.014>

Marrinan, T., Nishimoto, A., Insley, J.A., Rizzi, S., Johnson, A. and Papka, M.E. 2016. Interactive Multi-Modal Display Spaces for Visual Analysis. *Proceedings of the 2016 ACM on Interactive Surfaces and Spaces* (New York, NY, USA, 2016), 421–426. DOI: <https://doi.org/10.1145/2992154.2996792>

Hanula, P., Piekutowski, K., Uribe C., Almryde, K., Nishimoto, A., Aguilera, J., and Marai, G. E. Cavern Halos: Exploring Spatial and Nonspatial Cosmological Data in an Immersive Virtual Environment. In 2015 *IEEE Scientific Visualization Conference (SciVis)*, 87–99, 2015. doi:10.1109/SciVis.2015.7429497.

Tsoupikova, D., Rettberg, S., Coover, R., Nishimoto, A., The Battle for Hearts and Minds: Interrogation and Torture in the Age of War. 2015. ACM SIGGRAPH 2015 Posters on - SIGGRAPH '15 (Los Angeles, California, 2015).

Coover, R., Rettberg, S., Tsoupikova, D. and Nishimoto, A. Hearts and Minds: The Interrogations Project. In *Proceedings of the IEEE VIS Arts Program (VISAP)*, Paris, France, November 2014.

Marrinan, T., Aurisano, J., Nishimoto, A., Bharadwaj, K., Mateevitsi, V., Renambot, L., Long, L., Johnson, A. and Leigh, J. SAGE2: A New Approach for Data Intensive Collaboration Using Scalable

Resolution Shared Displays. *CollaborateCom*. Miami, FL, October 2014. DOI: 10.4108/icst.collaboratecom.2014.257337

Nishimoto, A. *Multi-User Interface for Scalable Resolution Touch Walls*, MS Thesis, Department of Computer Science, University of Illinois at Chicago, 2014.

Febretti, A., Nishimoto, A., Mateevitsi, V., Renambot, L., Johnson, A. and Leigh, J. 2014. Omegalib: A multi-view application framework for hybrid reality display environments. *Virtual Reality (VR), 2014 IEEE* (2014), 9–14. DOI: <https://doi.org/10.1109/VR.2014.6802043>

Reda, K., Chau, D., Mostafa, Y., Sujatha, N., Leigh, J., Nishimoto, A., Kahler, E. and Demeter, J. 2014. Design Guidelines for Multiplayer Video Games on Multi-touch Displays. *Computers in Entertainment*. 11, 1 (Mar. 2014), 1–17. DOI: 10.1145/2543698.2543699

Febretti, A., Nishimoto, A., Thigpen, T., Talandis, J., Long, L., Pirtle, J.D., Peterka, T., Verlo, A., Brown, M. and Plepys, D. 2013. CAVE2: a hybrid reality environment for immersive simulation and information analysis. *IS&T/SPIE Electronic Imaging* (2013), 864903–864903. DOI: <http://dx.doi.org/10.1117/12.2005484>

Febretti, A., Mateevitsi, V.A., Chau, D., Nishimoto, A., McGinnis, B., Misterka, J., Johnson, A. and Leigh, J. 2011. The OmegaDesk: Towards a Hybrid 2D and 3D Work Desk. *Advances in Visual Computing*. Springer. 13–23.

Nishimoto, A. Fleet Commander – YouTube: <http://www.youtube.com/watch?v=6V0o3TjB2Tw>, 700,000+ views, July 2011.

Nishimoto, A. 20 Foot Virtual Canvas – YouTube: <http://www.youtube.com/watch?v=lq6ShJnwr1Y>, Nov 2010.

Nishimoto, A. Fleet Commander on TacTile - YouTube: <http://www.youtube.com/watch?v=YI5oerC7GPg>, August 2010.

## HONORS AND AWARDS

UIC College of Engineering Exceptional Research Promise Award, 2022

UIC Graduate College Image of Research, Honorable Mention, Dōkutsu, 2022

Illinois Technology Foundation, Fifty for the Future, 2018

Google Games: Campus Edition, Third place out of fifty teams, 2017

UIC Graduate College Image of Research, Honorable Mention, Under the Virtual Ice, 2017

The Robert Coover Award for a Work of Electronic Literature, Hearts & Minds: The Interrogation Project, 2017

UIC Chancellor's Student Service Award, 2016

CollaborateCom Best Paper, SAGE2: A New Approach for Data Intensive Collaboration Using Scalable Resolution Shared Displays, 2014

UIC Graduate College Image of Research, Honorable Mention, Getting In Touch with the Data, 2014

UIC Graduate College Image of Research, Honorable Mention, 20-Foot Virtual Canvas, 2011

## PROFESSIONAL ACTIVITIES

Technical Director and Supporting Actor, Hummingbird, public theatrical performance at UIC/EVL as part of the Chicago Goodman Theatre's New Stages Festival, Chicago, IL, December 2-6, 2021. Responsible for the development and maintenance of all technical equipment including the VR HMDs participants used to experience the Hummingbird live theater performance as well as other show equipment such as display walls used in the pre-show, and smart lights in the performance space. Worked with the director and production managers to ensure smooth operation of 10 public performances with both VR participants and audience observers. Held a minor speaking role while handing out VR devices to participants.

Technical Director and Background Extra, Hummingbird, theatrical workshop at UIC/EVL, Chicago, IL, June 9-20, 2021. Same responsibilities as December 2021 show. Worked with the director and production managers to ensure smooth operation of 9 performances with test audiences. Held a non-speaking role to hand out VR devices to participants.

Demonstrator and panelist, Nobel Peace Prize Forum, Augsburg University, Minneapolis, Minnesota, September 14-16, 2017. Presented Hearts and Minds: The Interrogations Project to an auditorium audience, highlighting the technical contributions of using virtual reality as a storytelling medium. Participated in a roundtable discussion with other artists, musicians, writers, and human rights advocates on the arts as a tool for human rights.

Guest Lecturer, Virtual Reality course, School of the Art Institute of Chicago, Chicago, IL, October 17, 2017.

Demonstrator, Ethnographic Anthropology course from University of Chicago, event at UIC/EVL, Chicago, IL, January 18, 2017. Presented Hearts and Minds in CAVE2.

Member of a UIC student delegation to present UIC's request for qualifications proposal for the Obama Presidential Library. Presented UIC's technological innovations to congressional staffers. Washington D.C., June 16, 2014.

Demonstrator, US DOE Computer Graphics Forum, event at UIC/EVL, Chicago, IL, April 23, 2014.

Research consultation and training, Monash University, Melbourne, Australia, September 20-28, 2013. Worked with researchers at the eScience Research Center at Monash to install, configure and train them on UIC software for the CAVE2™ Hybrid Reality Environment. (Monash purchased the hardware from Mechdyne Corporation).

Demonstrator, US Ignite Application Summit, event at UIC/EVL, Chicago, IL, June 2013.

Demonstrator, University of Illinois at Chicago, 12th Annual Global LambdaGrid Workshop, sponsored by the Global Lambda Integrated Facility (GLIF), event at UIC/EVL, Chicago, IL, October 2012.

Demonstrator and Technical Support, King Abdullah University of Science and Technology (KAUST) booth, Supercomputing 11 Conference, Seattle, WA, November 2011.

Demonstrator and Technical Support, KAUST booth, SIGGRAPH 11 Conference, Vancouver, Canada, August 2011. "20-Foot Virtual Canvas" was featured on the front page of the *Vancouver Sun's* Business section.

Touchscreen Technical Support for SAGE demonstration at Lucasfilm, San Francisco, CA, July 2011.

## PERSONAL

### Hobbies

- Personal Projects Blog
  - <http://arthurnishimoto.blogspot.com/>
- 3D modeling and Interaction Prototyping
  - <http://enterprisevr.blogspot.com/>
- Drawing/sketching
- Science fiction
- Trumpet (1997 – 2009)