Roland Aigner, MSc. (he, him)

E-mail: himself@rolandaigner.com

Web: www.rolandaigner.com

www.researchgate.net/profile/Roland-Aigner

www.linkedin.com/in/roland-aigner-1bb1672a/

Education:

03/2024 – **Vienna University of Technology, Vienna, Austria**
https://www.tuwien.at/en/

Doctoral Programme, Technical Sciences (Computer Sciences)

10/2008 – 10/2010 **University of Applied Sciences Upper Austria, Hagenberg, Austria**
http://www.fh-ooe.at/im/

Master of Science in Engineering, Digital Media (Special focus: Interactive Media)

Master Thesis on development and evaluation of a novel multimodal interaction technique for online-programming of grasping processes for industrial robot arms

Graduation passed with high distinction

10/2005 – 09/2008 **University of Applied Sciences Upper Austria, Hagenberg, Austria**
http://www.fh-ooe.at/mtd/

Bachelor of Science in Engineering, Media Technology and Design

Bachelor Thesis on computer simulated kinematics and dynamics systems for low-latency applications

Graduation passed with high distinction

09/1993 – 06/1998 **Secondary Technical College, Braunau am Inn, Austria**
http://www.htl-braunau.at/

Matura (corresponds A-Levels), Information Technology

Professional Experience:

11/2018 – 02/2025 **Media Interaction Lab, University of Applied Sciences Upper Austria, Hagenberg, Austria**
https://fh-ooe.at/forschung/research-center-hagenberg

Key Researcher

- research into fabrication methods for textile sensors, in particular by computationally advancing the composition of multi-component knitted and embroidered textile artifacts using state-of-the-art manufacturing machinery and methods
- creation of JavaScript based utilities for procedural generation of multi-material structures for knitting and embroidery

- architecture and implementation of a general-purpose data processing pipeline for transforming and streaming live and pre-recorded data, in particular for sensing and capturing in the field of interactive media
- designing and performing controlled evaluations/studies for scientific exploitation of publication
- authoring of scientific publication for publishing in high-tier ACM venues and IEEE journals

11/2019 – 07/2021 **University of Applied Sciences Upper Austria, Department of Digital Media, Hagenberg, Austria**
http://www.fhooe.at/

Assistant Lecturer for Computer Graphics and programming fundamentals

- lecture and lab classes for basic programming concepts using the C programming language, (Bachelor's degree programme)
- lab classes for 2D and 3D computer graphics and programming with Java and C++ using OpenGL (Bachelor's degree programme)
- assistant lecturer for course for computer graphics programming with C++ using OpenGL and GLSL (Master's degree programme)

04/2016 – 10/2018 **Ars Electronica Futurelab, Ars Electronica GmbH, Linz, Austria**
http://www.aec.at/futurelab

Key Researcher, Artist & Visual computing programmer

- development of a novel computational geometry algorithm for creating foldable origami structures and corresponding crease patterns out of given non-foldable objects, as well as its implementation in form of a plugin for CAD tool Rhinoceros 3D with Grasshopper 3D visual programming interface, for providing control to designers and enabling immediate printing of the resulting patterns and construction of the corresponding origami shapes
- design and prototyping of studies for VW Design Center Potsdam, related to future of user interfaces in cars (under NDA)
- development of several prototypes for demanding and performance-critical applications in context of high-fidelity low-latency WAN streaming of live-captured ultra-high-resolution stereo video and 2.5D geometry
- project management, technical planning, programming, and media art design for adaptation of David Bowie's Broadway musical *Lazarus* for Musiktheater Linz, heavily utilizing projections of both pre-rendered and interactive contemporary media art computer graphics throughout the piece

11/2011 – 03/2016 **Ars Electronica Futurelab, Ars Electronica GmbH, Linz, Austria**
http://www.aec.at/futurelab

Researcher, Artist & Multimedia programmer

- research & development on body tracking and visualization components for interactive multimedia environments, targeted for stage art; most notably in collaboration with Vienna based media-art pioneer Klaus Obermaier and acclaimed British contemporary dancer and choreographer Aakash Odedra
- technical lead for a novel mixed media simulation and presentation installation for Audi AG, utilizing tabletop interaction and tangible user interfaces, showcased at CES 2015 in Las Vegas
- lead development on multiple performance-critical media installations and visualizations, e.g. OpenGL-based point cloud splatting renderer for Cultural Heritage program of Ars Electronica Deep Space 8K Virtual Reality environment, presenting substantial colored 3D laser scans of numerous historical sites in an interactive and user-controllable manner
- development and operation of a custom body tracking and RGBD-data streaming infrastructure, used for vvvv-based computer graphics visuals for classical music accompanying Maurice Ravel's piece *Ma Mère l'Oye*, as staged and performed in collaboration with the LA Philharmonics at the LA Phil Disney Hall, Los Angeles, CA
- contracted research, concept, speculative design, and prototyping works for numerous clients and partners, e.g. BMW AG, Audi AG, Siemens AG, and cutting-edge fashion-tech designer Anouk Wipprecht

05/2011 – 10/2011 **Mixed Reality Lab/CUTE-Center, Interactive and Digital Media Institute, National University of Singapore, Singapore**
http://www.mixedrealitylab.org/

Research Associate; investigating 3D hand gesture-based interaction, focusing on usage of specific gesture styles

- conducted an extensive user study to gain deeper insights of gesture communication
- developed several demos for a novel auto-stereoscopic display prototype

03/2011 – 04/2011 **Media Interaction Lab, University of Applied Sciences Upper Austria, Hagenberg, Austria**
https://fh-ooe.at/forschung/research-center-hagenberg

Research Associate

- development of a tool for automatic calibration of intrinsic and extrinsic parameters of a projector/Kinect Augmented Reality setup

11/2010 – 02/2011 **Microsoft Research, Adaptive Systems and Interaction, Redmond**
http://research.microsoft.com/

Research Intern; investigating 3D hand gesture-based interaction, focusing on gesture spotting

- conducted a preliminary user study to investigate delimiters for mid-air hand gestures (aka. “gesture-spotting”)
- developed a prototype for testing four different techniques of gesture delimiting for three different applications

11/2008 – 10/2010 **Media Interaction Lab, University of Applied Sciences Upper Austria, Hagenberg, Austria**
https://fh-ooe.at/forschung/research-center-hagenberg

Research Associate

- development of an Augmented Reality front-end for meta-data visualization and advanced interaction with industrial robots, using video see-through displays as well as a yaw/pitch-steerable projector
- design, development and evaluation of a novel multimodal interaction technique for online-programming of grasp processes for robotic arms
- conducted a user study to compare the newly developed interaction technique against conventional ones

02/2008 – 07/2008 **3DExcite GmbH (formerly Realtime Technology AG), Munich, Germany**
http://www.3dexceite.com/

Research Intern

- benchmarks and optimization of load balancing for clustered high-quality CGI ray-tracers
- server and client prototypes for low-latency WAN-streaming of interactive and high-fidelity imagery for in web browsers

09/1999 – 09/2005 **funworld ag, Schörfling am Attersee, Austria**
http://www.photoplay.com/

Software developer of 2D- and 3D-touchscreen games, designer for 2D-gamegraphics, game designer

Development of casual games, applications, and system components

- programming in C++, C# and ActionScript, design work mainly done in Adobe Photoshop, Jasc PaintShop Pro and Macromedia Flash
- game design, graphics and software-development of more than 15 touchscreen-based games, including several best-sellers
- planning, design, and programming of a mayor part of an extensive menu- and community-system font end for touchscreen game terminals, targeted for a base of 1 million+ active users

Miscellaneous:

02/2011 – **Volunteering Peer Reviewer for ACM, IEEE, Elsevier**

http://www.acm.org/

http://www.ieee.org/

https://www.elsevier.com/

Volunteering peer reviewer for scientific journals and conference papers

- ACM CHI (2012 – 2013, 2019, 2021 – 2025), UIST (2019, 2021, 2023, 2024), DIS (2021, 2023), UbiComp, TEI (2023, 2024), IMWUT (2021, 2022, 2024), ISS (2024)
- IEEE Sensors Letters (2022, 2023), VR (2024)
- Elsevier IJHCS (2021)

09/1998 – 08/1999 **Alternative military service: Landespflegeanstalt Schloß Cumberland in Gmunden, Austria**

Nurse at special-care home for mentally disabled people

Publications:

peer-reviewed papers and articles

Aigner, R., Wolling, F., & Michahelles, F. *Embroidered Driven Shields for Robust Textile Touch Interfaces.* To appear in IEEE Journal of Flexible Electronics (J-FLEX), 2025. DOI: 10.1109/JFLEX.2025.3571382

Aigner, R., Haberfellner, M.A., & Haller, M. *Loopsense: low-scale, unobtrusive, and minimally invasive knitted force sensors for multi-modal input, enabled by selective loop-meshing.* In *CHI'24: proceedings of the CHI Conference on Human Factors in Computing Systems*, Honolulu, Hawai'i, USA, 2024. DOI: 10.1145/3613904.3642528 (**Best Paper Honorable Mention Award**)

Aigner, R. & Hepper, F. *An Evaluation of Multi-Component Weft-Knitted Twill Structures for Sensing Tensile Force*. In *IEEE Sensors Journal (Sens. J.)*, Jan. 2024. doi:10.1109/JSEN.2024.3353821

Aigner, R. & Stöckl, A. *Machine Learning Based Compensation for Inconsistencies in Knitted Force Sensors*. In *IEEE Sensors Journal (Sens. J.)*, Jan. 2024. doi:10.1109/JSEN.2023.3346686

Petz, P., Zeinzinger, M., Eibensteiner, F., Langer, J., & **Aigner, R.** *Drift Compensation of Wearable Textile Sensors in Mobile Applications.* In *ICECET'23: International Conference on Electrical, Computer and Energy Technologies*, Cape Town, South Africa, Nov. 2023. doi:10.1109/ICECET58911.2023.10389221

Aigner, R., Haberfellner, M.A., & Haller, M. *spaceR: Knitting Ready-Made, Tactile, and Highly Responsive Spacer-Fabric Force Sensors for Continuous Input*. In *UIST'22: proceedings of the 35th annual ACM symposium on User Interface Software and Technology*, Bend, Oregon, USA, 2022. doi:10.1145/3526113.3545694

Pointner, A., Preindl, T., Mlakar, S., **Aigner, R.,** Haberfellner, M.A., Haller, M. *Knitted Force Sensors*. In UIST'22 Adjunct: the adjunct publication of the 35th annual ACM symposium on User Interface Software and Technology, Bend, Oregon, USA, 2022. doi:10.1145/3526114.3558656

Aigner, R., Pointner, A., Preindl, T., Danner, R., & Haller, M. *TexYZ: Embroidering enameled wires for three degree-of-freedom mutual capacitive sensing*. In *CHI'21: proceedings of the 39th international*

conference on Human Factors in Computing Systems, Yokohama, Japan, 2021. DOI:10.1145/3411764.3445479 (**Best Paper Honorable Mention Award**)

Preindl, T., Honnet, C., Pointner, A., **Aigner, R.,** Paradiso, J.A., & Haller, M. *Sonoflex: embroidered speakers without permanent magnets*. In UIST'20: 33rd ACM User Interface Software and Technology Symposium, Minneapolis, Minnesota, USA, 2020. DOI:10.1145/3379337.3415888

Pointner, A., Preindl, T., Mlakar, S., **Aigner, R.,** & Haller, M. *Knitted RESi: A Highly Flexible, Force-Sensitive Knitted Textile Based on Resistive Yarns.* In *ACM SIGGRAPH'20 Emerging Technologies*, Washington, DC, USA. Article 1, 1–2. DOI:10.1145/3388534.3407292

Aigner, R., Pointner, A., Preindl, T., Parzer, P., & Haller, M. *Embroidered Resistive Pressure Sensors: a Novel Approach for Textile Interfaces*. In *CHI'20: proceedings of the 38th international conference on Human Factors in Computing Systems*, Honolulu, Hawai'i, USA. (2020) DOI:10.1145/3313831.3376305

Gardiner, M., **Aigner, R.,** Ogawa, H., Reitböck, E., & Hanlon, R. *Fold Printing: Using Digital Fabrication of Multi-Materials for Advanced Origami Prototyping*. In Origami^{7}. Volume 4: Engineering Two. Proceedings from the 7th International Meeting on Origami in Science, Mathematics, and Education. pp 1345-1356. Tarquin, United Kingdom. (2018)

Gardiner, M., **Aigner, R.,** Ogawa, H., & Hanlon, R. *Fold Mapping: Parametric Design of Origami Surfaces with Periodic Tessellations*. In Origami^{7}. Volume 1: Design, Education, History, and Science. Proceedings from the 7th International Meeting on Origami in Science, Mathematics, and Education. Pp 105-118. Tarquin, United Kingdom. (2018)

Lindinger, C., Mara, M., Obermaier, K., **Aigner, R.,** Haring, R., & Pauser, V. (2013). The (St)Age of Participation: audience involvement in interactive performances. *Digital Creativity, 24* (Special Issue: Performance Art and Digital Media), 119-129.

Nii, H., Zhu, K., Yoshikawa, H., Lin Htat, N., **Aigner, R.,** & Nakatsu, R. *Fuwa-Vision: an auto-stereoscopic floating-image display.* In *SIGGRAPH Asia 2012 Emerging Technologies* (SA '12). ACM, New York, NY, USA, Article 13, 4 pages. DOI:10.1145/2407707.2407720

Other publications

Aigner, R., Wigdor, D., Benko, H., Haller, M., Lindlbauer, D., Ion, A., Zhao, S., & Koh, J.T.K.V. *Understanding mid-air hand gestures: a study of human preferences in usage of gesture types for HCI.* Microsoft Research Technical Report, MSR-TR-2012-111 http://research.microsoft.com/apps/pubs/default.aspx?id=175454

Aigner, R. *The Development and Evaluation of an Augmented Reality Assisted Multimodal Interaction System for a Robotic Arm*. Master Thesis, Digital Media, University of Applied Sciences, Hagenberg, Austria, 2010.

Technical skills:

General:

- high expertise in software prototyping and programming (especially Visual Studio and VS Code), with special focus on visual and geometric computing, interactive multimedia, and augmented and virtual reality
- expert knowledge of a wide variety of so-called Natural User Interface devices (Microsoft Kinect XB 360 & XBO, Intel RealSense, LeapMotion, pmd pico, UltraHaptics, Thalmic Myo, Google Project Soli, etc.), realtime tracking technologies (e.g., NaturalPoint OptiTrack), VR/AR headsets (HoloLens, Oculus Rift, HTC Vive, etc.), and imaging sensors (PointGrey/FLIR, iDS, AlliedVision, etc.), and related APIs and libraries

- highly experienced in planning, building, and operating experimental and distributed multimedia and virtual reality infrastructures for permanent installations and stage art, related networking communication technologies, (e.g., OSC, TUIO, VRPN, MIDI, RTP/RTSP, TCP, UDP, Bluetooth, MQTT, CAN, etc.)
- know-how in interaction design, media installation design and orchestration, and game design
- experienced in 2D and 3D design for screen and print, 3D modeling and animation, audio and video editing (mostly Adobe Suite and Autodesk Maya)
- experienced in applying scientific approaches within the fields, working in and managing scientific projects, including publication and exploitation
- fluent in German (native) and English

Programming & scripting (selected):

- highly experienced: C/C++, C#, GLSL, Cg, CUDA, OpenCL
- experienced: Python/Jupyter, JavaScript/TypeScript, MATLAB, Arduino, LaTeX
- basic knowledge: Bash, LUA

Other technologies & toolsets (selected):

- Computer Graphics: OpenGL, GLSL, Cg, DirectX, HLSL, OpenSceneGraph
- Visual Computing and Tracking, Multimedia Processing: OpenCV, PCL (Point Cloud Library), OpenNI/NITE, Kinect SDK (Kinect for XBox 360, Kinect for XBox One, Azure Kinect)
- Media Streaming and Networking: NVCodec, live555, FFMpeg, DirectShow
- GPGPU, High Performance/Parallel Computing: OpenCL, Nvidia CUDA, OpenMP
- Developing Tools and Environments: Visual Studio, Unity3D, vvvv, Processing, Git