Personal Information

Zachmann, Gabriel
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Current position: Professor (W3), head of the computer graphics and virtual reality lab
Birthday: 1967

Degrees

2000	Dr.-Ing. (summa cum laude) from Technical University Darmstadt; Dissertation topic: "Virtual Reality in Assembly Simulation"; Advisors: Prof. Dr.-Ing. J. L. Encarnaçao, Prof. Carolina Cruz-Neira, PhD
1994	Diploma in computer science from Technical University Darmstadt, minor in mathematics
1990	Vordiplom (similar to Bachelor) in computer science at Technical University Karlsruhe (KIT), minor in physics

Academic Career

2012 -- present	Professor for Computer Graphics and Virtual Reality, University of Bremen
2010 , 2012	Visiting Professor with Nanyang Technological University, Singapore
2005 -- 2012	Professor for Computer Graphics, Clausthal University
2003 -- 2005	Head of the Junior Investigator's Group, University of Bonn, for the research topic "New, Intuitive Interaction Methods for Efficient, Next Generation Virtual Prototyping", funded by the DFG (German Research Foundation) within the "Aktionsplan für Informatik" framework (part of Emmy-Noether)
2001 -- 2003	PostDoc with Prof. Dr. Reinhard Klein, head of the computer graphics group at University of Bonn
1994 -- 2001	Scientific researcher, Fraunhofer Institute for Computer Graphics (FhG-IGD), Darmstadt, department for virtual reality and visualization
1994	Research stay with the National Center for Supercomputing Applications (NCSA) in Urbana/Champaign, Illinois, USA

Research interests

In general: visual computing, computer graphics, virtual reality, computer vision, human-computer interaction.

In particular:

Geometric algorithms and acceleration data structures for computer graphics, in particular collision detection, such as proximity computations, and related topics

Virtual reality systems architectures, for instance, for space mission simulations

Immersive, 3D user interaction techniques

Medical virtual simulation systems and methodologies

Massively-parallel algorithms on the GPU, such as sorting on the GPU, geometric algorithms (e.g., proximity computations) on the GPU, computer-vision algorithms on the GPU

Sphere packings and its applications in computer graphics

Point cloud processing, e.g., for damage assessment, autonomous operating room lamps, object definitions based on point clouds, intersection computations on point clouds, etc.

Virtual prototyping, in particular virtual assembly simulation

Virtual reality in general

Computer vision-based, markerless hand tracking

Algorithms in haptics and force-feedback

Immersive visualization, virtual cities, etc.

Dedicated hardware for collision detection (see e.g. the research project "Collision Chip", funded by the DFG in 2004, in cooperation with Bonn University)

Professional Activities

Founding member of the Executive Board of the EuroXR Association since 2012.
Lead of the XR Open Forum Task Force within EuroXR; member of the Task Force for the EuroXR conference.

Member of the Steering Committee of the ICAT-EGVE conference since 2014.

Associate Editor of The Visual Computer Journal (Springer).

Member of the Steering Committee for the ICAT conference since 2014.

Member of the Steering Committee for EGVE (Eurographics Workshop on Virtual Environments) since 2019.

External examiner for the M.Sc./P.Grad.Dip. program in Computer Science Interactive Entertainment Technology at the Trinity College Dublin, Ireland; 2013 - 2016

General Co-Chair of the VRIPHYS conferences in 2013, 2014 & 2015

Organizer, general chair, and program committee chair of the VRIPHYS 2014 in Bremen, Germany

Organizer, general chair, and program committee chair of the EuroVR Conference in 2014 in Bremen, Germany

Organizer of the EGVE workshop (Eurographics Workshop on Virtual Environments) in 2014 in Bremen, Germany

Member of the Review Panel in the Human Brain Project for the Competitive Call for additional project partners; Jan 2014

Member of the executive board („Leitungsgremium“) of the special interest group (SIG) on VR/AR of the German Computer Science Society (GI-Fachgruppe VR/AR), 2013

Vice Leader of the HapticSIG, a special interest group within the EuroVR. 2013

Member of the program and/or conference committees of various conferences such as VRST, IEEE VR, EGVE, Web3D, JVRC, ICAT-EGVE, etc.

Co-Chair of the Scientific Visualization Contest of the IEEE VisWeek 2011, 2012, and 2013

Area Chair / Associate Editor for Tack II: Virtual Reality and Medical Applications, at ICPR 2012

Member of the Conference Committee of IEEE VR since 2008 in various roles

Visiting Professor with Nanyang Technological University (NTU), Singapore, 2010 and 2012.

Expert reviewer for the monitoring of EU STREP project Net-WMS (034691) within FP6 in 2007-2010

Member of the review panel "Information and Communication Technologies" for the Cyprus Research Promotion Foundation (RPF) in 2008-2009

Reviewer for the German Science Foundation (DFG) and other funding agencies, such as the Austrian Science Foundation (FFG), and the Investitions- und Strukturbank Rheinland- Pfalz (ISB)

Organizer of the workshop “Tracking for Virtual Environments” for IEEE VR 2007

Co-organizer of the 3rd Workshop VR/AR of the GI (German society for computer science), 2005

Reviewer for numerous conferences such as Eurographics, Siggraph, SIGCHI, IEEE VR, EGVE, ICRA, IEEE Visualization, IEEE InfoVis, VRST, etc., and numerous journals such as J. of Computational Geometry & Applications, ACM Transactions on Visualization, ACM

Transactions on Graphics, IEEE Trans. on Visualization and Computer Graphics, El- sevier CG&A, Computer-Aided Design, ACM Computing Surveys, IEEE Transactions on Robotics, etc.

External examiner or referee of many PhD theses and candidates, both in Germany and Europe

Dean of Studies ("Studiendekan") for the School of Mathematics, Computer Science, and Mechanical Engineering, Clausthal University, 2008-2012

Relevant Publications

Tan,T., Weller R., Zachmann G.: SIMDop: SIMD Optimized Bounding Volume Hierarchies for Collision Detection. Proc. of the IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) 2019.

Debowski, N., Weller R., Zachmann G.: kDet: Parallel Constant Time Collision Detection for Polygonal Objects. Proc. of the Eurographics Conference, 2017.

Patrick Lange, Rene Weller, Gabriel Zachmann: *Scalable Concurrency Control for Massively Collaborative Virtual Environments*. ACM Multimedia Systems, Massively Multiuser Virtual Environments (MMVE) 2015, Portland, United States, March 18 - 20, 2015.

Daniel Mohr and Gabriel Zachmann: *Hand pose recognition – overview and current research*. In G. Brunnett, S. Coquillart, R. van Liere, G. Welch, and L. Váša, editors, Virtual Realities, pages 108-129. Springer (Dagstuhl Seminar), 2013.

Rene Weller, Udo Frese, and Gabriel Zachmann: *Parallel collision detection in constant time*. In Virtual Reality Interactions and Physical Simulations (VRIPHYS), Lille, France, November 2013. Eurographics Association. **Best paper award**.

Daniel Mohr and Gabriel Zachmann: *Segmentation-free, area-based articulated object tracking*. In George Bebis et al. (editors), 7th International Symposium on Visual Computing, volume 6938 of Lecture Notes in Computer Science, pages 112–123. Springer, October 2011.

Rene Weller and Gabriel Zachmann: *Inner sphere trees and their application to collision detection*. In Sabine Coquillart, Guido Brunnett, and Greg Welch, editors, Virtual Realities (Dagstuhl seminar), chapter 10, pages 181-202. Springer, 2011.

Rene Weller and Gabriel Zachmann: *User performance in complex bi-manual haptic manipulation with 3 DOFs vs. 6 DOFs*. In Haptics Symposium, Vancouver, Canada, March 4-7 2012.

Gabriel Zachmann: *Adaptive Bitonic Sorting*. Encyclopaedia of Parallel Computing, David Padua (ed.), pp 146--157, Springer, 2011.

Rene Weller and Gabriel Zachmann: *ProtoSphere: A GPU-Assisted Prototype-Guided Sphere Packing Algorithm for Arbitrary Objects*. ACM SIGGRAPH Asia 2010 Sketches, Dec 2010, Seoul, Republic of Korea.

Daniel Mohr and Gabriel Zachmann: *FAST: Fast Adaptive Silhouette Area based Template Matching*. Proceedings of the British Machine Vision Conference (BMVC), Sep 2010, pages 39.1-39.12.

Daniel Mohr, Gabriel Zachmann: *Silhouette Area Based Similarity Measure for Template Matching in Constant Time*. 6th International Conference of Articulated Motion and Deformable Objects (AMDO), Spain, 2010, pp 43-54.

Jan Klein, Gabriel Zachmann: *Point Cloud Collision Detection*. Eurographics 2004, Grenoble.

Elmar Langetepe, Gabriel Zachmann: *Geometric Data Structures for Computer Graphics*. AK Peters / CRC Press, 2006. ISBN 9781568812359.

Projects

Funding Agency	Program	Title	Start - Finish
BAB	FEI-Förderung	Telemedizin System für Phototherapie von Hauterkrankungen	2023 - 2024
BMBF	Interaktiven Technologien für Gesundheit und Lebensqualität	SISOPS: System zur berührungslosen Interaktion im Sterilbereich von OPs	2024 - 2026
DLR	Navigation	VaMex-3 VRN: Validated Robust Navigation Payload for VaMEx3	2022 - 2025
AWI/Helmholtz	INSPIRES	Forensic chemical fingerprinting of the ocean organic carbon cycle	2022 - 2025
DFG	Sachbeihilfe	ZA 292/11-1: Digital Morphology of Ornamentation - Development of Methods at the Interface between Art History and Computer Vision	2022 - 2025
DFG	Subprojects within SFB EASE	R03: A Knowledge Representation and Reasoning Framework for Prospection in Everyday Activity	2021 – 2025

Funding Agency	Program	Title	Start - Finish
UBRA	AI Center for Health Care	AI surgery tracking	2021 - 2023
BMBF	KMU-innovativ	Dynamischer Hüftimplantatssi-mulator (Dynamic HIPS)	2020 - 2022
DLR	Navigation	Cognitive autonomous navigation in space with application to resource exploitation in space, part spacecraft and rovers (Kanaria2-K2I-RR)	2019 - 2022
BMBF	Industrie-in-Klinik-Plattform	Steigerung von Ergonomie und Effizienz im OP durch Smarte Beleuchtung und Smarte Steuerung (SmartOT)	2019 - 2021
DLR	Navigation	Optimal assisted, highly automated, autonomous and cooperative navigation and localization in cars (OPA3L)	2019 - 2023
BMBF	“Bring Technology to People”	Versatile, immersive, virtual, and augmented tangible OR (Vivatop)	2018 - 2021
BMBF	Internationalisier-ungsstrategie (MOEL-SOEL)	Visual Autonomous Robotics (VAR)	2018 - 2019
DFG	SFB EASE, two sub-projects	H01.1 - Acquiring activity models by situating people in virtual envi-ronments R03.1 - Embodied simulation-enabled reasoning	2017 - 2021
DLR	Navigation	Modular virtual Testbed for the VaMex Initiative (VaMex-VTB)	2017 - 2019
DFG	Major Instrumentation (Großgeräte-Antrag)	Multi-User Multimodal Mixed-Reality Interaction Environment	2016 - 2018
BMWi	ZIM	Hüftimplantat Pfannenfrässimulator (HIPS) (Engl.: VR Simulator of milling of hip joints for implants)	2016 - 2018
DLR	Navigation	Kognitionsbasierte, autonome Navigation am Beispiel des Ressourcenabbaus im All (KaNaRiA)	2013 - 2017

Funding Agency	Program	Title	Start - Finish
DFG	SFB Spatial Cognition Nachrücker-projekt	Dexterous Spatial Interactive Manipulation of Virtual Objects (sub-project I08)	2013-2014
DFG	Action Plan for Computer Science ("Aktionsplan Informatik" within Emmy-Noether)	Novel Interaction Methods in Virtual Prototyping	2003 - 2008
DFG	Open submission	ZA 292/2-3: Collision Chip 2 - Massively parallel algorithms and architectures for hardware-accelerated collision detection in real-time computer graphics	2007 - 2010
DFG	Open submission	Collision Chip - Massively parallel, hardware-supported collision detection	2004 - 2006
BMBF	High-tech strategy of the German ministry for research (IKT2020)	AVILUS - Angewandte Virtuelle Technologien im Produkt- und Produktionsmittellebenszyklus	2008 - 2011
DAAD	Mobility and Partnering	Virtual Cities	2002 - 2003

Supervised Dissertations

Year	PhD	Title	Advisorship
2012	Rene Weller	*New Geometric Data Structures for Collision Detection* (summa cum laude)	Primary
2012	Daniel Mohr	*Model-Based High-Dimensional Pose Estimation with Application to Hand Tracking*	Primary
2015	Stefan Mock	*Simulation von hoch polydispersen zufällig dichten Partikelpackungen unter Berücksichtigung der Agglomeration im Feinstkornbereich*	Secondary

2015	David Mainzer	*New Geometric Algorithms and Data Structures for Collision Detection of Dynamically Deforming Ob-jects*	Primary
2020	Xizhi Li	*Procedural 3D Asteroid Model Synthesis*	Primary
2020	Michael Otto	*The Virtual Manufacturing Station, A Framework for Collaborative Assessment of Manual Assembly Tasks*	Secondary
2021	Moritz Cohrs	*New Methodologies for Automotive PLM by Integrating 3D CAD and Virtual Reality into Function-oriented Development*	Primary
2023	Roland Fischer	*Novel Algorithms and Methods for Immersive Telepresence and Collaborative VR*	Primary