High-Performance Graphics 2021

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N. Binder and T. Ritschel
(Guest Editors)

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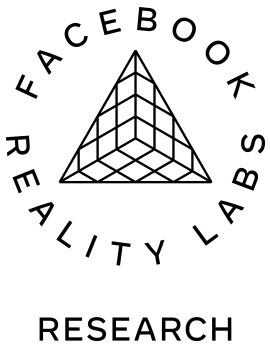

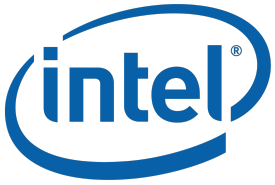

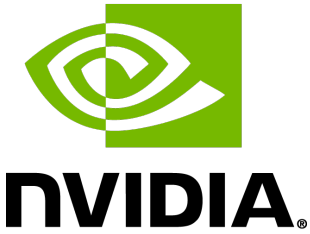

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Keynote

Optimising for Artist Happiness

Alex Evans

Abstract

There are many approaches to and customers of graphics research, each with different needs. My background in graphics began in the Demoscene, where one only needed to tune your algorithms for the best, prettiest case; The majority of my career, however, was spent in the games industry, building tools for millions of creative users – artists. When you only have loose control over how your algorithms are applied, there is only one choice: to concentrate on the worst case. In this talk, I'd like to convince you that doing so is worthwhile, and ends up being equivalent to 'optimising for artist happiness'. I'll illustrate the idea with examples from my past work and finally ask the question: what place do volumetric geometry techniques have in the future of high performance graphics?

Short Biography

Alex Evans was a cofounder and technical director of MediaMolecule, a game studio best known for its work in "creative gaming," with titles including LittleBigPlanet and Dreams, which brought to a wide audience a set of creative tools built on Signed Distance Fields. He joined NVIDIA Research at the end of 2020.

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Invited Talk

Embree "There and back again…" (Carsten Benthin, Ingo Wald)

Abstract

Looking back at the origins of Embree, how it developed through the years and some of the (surprising) issues it faced along its long journey towards an Academy Award.

Short Biographies

Carsten Benthin is a principal engineer at Intel Corporation responsible for researching, designing, implementing, and evaluating high performance visualization and rendering algorithms. He is the lead performance architect of the Embree Ray Tracing Kernels focusing on software and hardware optimizations for CPU and GPU architectures. Carsten holds a master's degree in Computer Science and received his PhD on ray tracing optimizations for CPU architectures, both from Saarland University in Germany. Carsten published over 30 papers at top-tier conferences and holds 29 patents. His interest and expertise include computer graphics, high-performance rendering, low-level hardware optimizations, hardware design, parallel algorithms and programming.

Ingo Wald is a director at NVIDIA. He received his PhD from Saarland University and worked as a postdoctoral researcher at the Max Planck Institute for Informatics in Saarbruecken. He spent two years as a Research Professor at the Scientific Computing and Imaging Institute (SCI) and School of Computing at the University of Utah. Since 2005, Ingo was a member of the Intel Labs working on high-performance ray tracing, rendering, and visualization, hardware architectures for high-performance graphics, and SPMD compiler technology for such architecture. Since 2015, he has been an Adjunct Assistant Professor at the University of Utah and, in 2018, he joined NVIDIA.

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Invited Talk

Grand challenges in synthetic radar data generation for AI (Karl Leiss, Matteo Marone)

Abstract

Raytracing is a powerful approach for the emulation of camera sensor outputs. How about using it for radar sensor simulation? What are the relevant aspects to generate synthetic radar data in the domain of autonomous mobility?

The talk outlines challenges towards the adoption of raytracing for physical based electromagnetic wave simulation and where to derive meta data from, needed by AI to classify objects based on their radar signature.

In addition physical based radar simulation is compute power intense – what is the potential of the latest hardware products and their optimized libraries to boost performance.

Company Information

BIT technology generates photo-realistic 3D models of our world. Building on real-world 3D data, they have built an advanced content generation pipeline, which produces the ground truth for deep learning and validation of artificial intelligence. BIT's technology aims at a scalable creation, with ultra-detailed resolution and fast variation of scenarios. Their applications target future mobility for which 3D data matching the real world is mandatory.

Short Biographies

Karl Leiss is the CEO of BIT Technology Solutions, that was founded in 2014. He founded his first company in 2004 with the scope of test benches for embedded real-time systems and the development of energy recovery systems for motorsports based on his university background in mechanical engineering and computer science. From 2011 on he worked in the semiconductor industry on embedded PowerPC devices for high speed signal processing and established as product manager one of the largest ISO26262 ready microcontroller families in the industry.

Dr. Matteo Marone is the Senior Physics Engineer for BIT Technology Solutions. He got his Ph.D in High Energy Physics at the University of Turin and post-doc at the University of Trieste. He was involved for 10 years in the construction, calibration and data analysis of the Compact Muon Solenoid experiment (CMS), one of the particle physics experiments that are currently taking data at CERN in Geneva. Since 2014 he has been working for private companies in sensor R&D and simulations.

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Invited Talk

Fireballs and Lightning: Visualising Esports Experiences

Anders Drachen

Abstract

In the 25 bn esports industry, data is king. With detailed data from every single match being played across all levels of skill, covering uncounted hundreds of thousands of years of playtime, there is no bottom in the ocean of data that we can analyse and visualise.

The availability of data, the digital nature of the games, the technical infrastructure and the surrounding young audiences has led esports to become a rapidly innovating sector, which is constantly striving to invent new ways of engaging audiences. More than half a billion people play esports games regularly, and the audiences are young, technologically in the forefront and keen to be involved in the experience, as opposed to traditional one-size-fits-all sports broadcasting. They are the audience of the future, and esports has become a testbed for new entertainment technologies, with companies launching new initiatives on a daily basis. Jointly, this has launched esports as the fastest growing entertainment sector worldwide.

On this exciting background, the UKRI/Innovate UK Demonstrator project Weavr was launched in 2019 as a collaboration between seven companies and the University of York. Weavr has since its inception launched data-driven, interactive and personalised audience-facing experienced across mobile platforms, VR, AR, 2nd screen, and other formats, all utilising data from esports matches to tell stories with data. 27 million views and 8 million users later, Weavr is ready to present some experiences from the project and highlight the potential impact of data visualization in esports.

Short Biography

Anders Drachen is recognized as one of the world's most influential people in business intelligence in the Creative Industries, and a core innovator in the domain. His work has assisted major international game publishers, as well as SMEs, make better decisions based on their data. He currently serves as Professor at the Department of Computer Science, University of York. He is the Lead Analyst of the UKRI Audience of the Future Demonstrator Weavr. which is building new data-driven audience experiences across esports and sports. He is also the manager of the Arena Research Cluster, an international research network focused on innovation in esports and sports. His award-winning research has seen worldwide media coverage, and his books have seen hundreds of thousands of downloads, forming standard works of reference in-game data science and games user research. In his private life, he writes books for children about technology and economics.

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Invited Talk

Modeling user behavior for improved virtual reality applications

Belen Masia

Abstract

Virtual Reality (VR) can dramatically change the way we create and consume content in areas of our everyday life, including entertainment, training, design, communication or advertising. Understanding how people explore immersive virtual environments (VE), and how they behave in them, is crucial for many applications in VR, such as designing content, developing new compression algorithms, or improving the interaction with virtual humans. This talk will give an overview of our work in this area, including modeling viewing behavior in VE, imperceptible manipulation of camera motion, or sensory degradation under certain circumstances.

Short Biography

Belen Masia is a tenured Associate Professor in the Computer Science Department at Universidad de Zaragoza, and a member of the Graphics and Imaging Lab. Before, she was a postdoctoral researcher at the Max Planck Institute for Informatics. Her research focuses on the areas of computational imaging, applied perception, and virtual reality. Belen Masia is a Eurographics Junior Fellow. She is also the recipient of a Eurographics Young Researcher Award in 2017, a Eurographics PhD Award in 2015, an award to the top ten innovators below 35 in Spain from MIT Technology Review in 2014, and an NVIDIA Graduate Fellowship in 2012. She currently serves as an Associate Editor for ACM Transactions on Graphics. She is the co-founder of the startup DIVE Medical.

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Invited Talk

High performance Interfaces for Modeling, Animation and more…

Karan Singh

Abstract

Creating and modifying 3D content is difficult. Sketch and sculpt interfaces are a promising medium of visual communication but there are a number of inherent limitations in human motor control, drawing skill, perception, and the ambiguities of inference, that make the leap from 2D input to 3D shape a challenging task. Similarly, creating facial animation is difficult. In this context, aspects of facial anatomy, biomechanics, linguistics and perceptual psychology should be considered for the construction of geometric face rigs, and techniques for the animator-centric creation of emotion, expression and speech animation from input images, audio and video. Finally, AR/VR offers new means of rethinking interaction, in particular the near quarter century old internet browser design of Mosaic and its successors. This talk will investigate novel solutions to address these challenges.

Short Biography

Karan Singh is a Professor of Computer Science at the University of Toronto. He co-directs a globally reputed graphics and HCI lab, DGP, has over 100 peer-reviewed publications, and has supervised over 40 MS/PhD theses. His research interests lie in interactive graphics, spanning art and visual perception, geometric design and fabrication, character animation and anatomy, and interaction techniques for mobile, Augmented and Virtual Reality (AR/VR). He has been a technical lead for the Oscar award winning software Maya and was the R&D Director for the 2004 Oscar winning animated short Ryan. He has co-founded multiple companies including Arcestra (architectural design), JALI (facial animation), and JanusVR (Virtual Reality).