ACM SIGGRAPH / Eurographics Symposium of Computer Animation 2022

Hybrid Symposium hosted at Durham University, UK

13 – 15 September 2022

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DOI: 10.1111/cgf.14648

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D. L. Michels and S. Pirk
(Guest Editors)

Volume 41 (*2022*), *Number 8*

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Editor's Note

The origin of computer animation dates back at least to the early 20th century when pioneers such as the cartoonist Winsor McCay started to generate sequences of animated images. McCay's 1914 work *Gertie the Dinosaur* – widely considered as a breakthrough establishing the new genre of animated film – has been the first to use animation loops, keyframes, and registration marks. With the advent of the digital era and the attendant increase of digital computers, animation techniques developed rapidly and became more sophisticated. In the 1990s, the first feature-length film made entirely on computers, *Toy Story*, has been produced by *Pixar* on behalf of *Disney* for the cinema.

Today, the creation of impressive three-dimensional scenes and deceptively real special effects are state-of-the-art. These developments would not have been possible without dedicated research in this area, and therefore it is not surprising that computer animation has always been at the core of the computer graphics community and advances have been primarily presented at the main North American graphics conference *SIGGRAPH* and at its European counterpart *Eurographics*.

In 2002, the community established an animation-focused academic venue next to the flagship *SIGGRAPH* and *Eurographics* conferences: This year, we celebrate the 20th anniversary of the *ACM SIGGRAPH/Eurographics Symposium on Computer Animation* (*SCA*) and its 21st edition. *SCA 2022* takes place as a hybrid symposium hosted at *Durham University* with the support of its chairs and a diverse team of 55 experts from leading institutions serving on the international program committee. Moreover, the list of *SCA*'s sponsors comprising *Adobe*, *Disney Research Studios*, *KAUST Visual Computing Center*, and *Google* reflects the industrial need of the presented topics which have to be understood as animation and simulation in a broad sense, defined as computation dealing with time-varying phenomena. While at the beginning of computer animation, the focus has almost exclusively been on movies and later on games, today the spectrum ranges from controlling smart agents in robotics over complex autonomous driving simulators to cloth animation for virtual try-on applications in e-commerce. Computer animation has truly become a key enabling technology for a diverse set of applications spanning digital services, medicine, robotics, consumer electronics and entertainment, as well as scientific discovery, to name just a few. Ongoing developments in virtual and augmented reality as well as in the context of the so-called metaverse reinforce this trend.

The *SCA* community has been and will be at the forefront of these developments and the conference will continue to be the premier forum for innovations in computer animation and simulation. This is reflected by this year's 78 submitted and 30 accepted academic papers corresponding to the highest number of submissions as well as the most accepted papers since ten years. With an acceptance rate of 38.5%, we are slightly below the average acceptance rate of the previous ten *SCA* conferences indicating that the increase of papers did not compromise quality. We are more than happy to present this year's papers included in this issue of *Eurographics*' flagship journal *Computer Graphics Forum* to the community.

Sincerely,

Dominik L. Michels, *KAUST*, Program Co-Chair and Guest Editor
Sören Pirk, *Adobe Research*, Program Co-Chair and Guest Editor

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Keynote

The Path to Perception Engineering

Steven LaValle
University of Oulu

Abstract

This talk starts with some motivational background from my own research on robot planning algorithms to the development of the Oculus Rift. This path has led us to propose that virtual reality (VR), and parts of other fields involving sensing and perception, can be reframed as perception engineering, in which the object being engineered is the perceptual illusion itself, and the physical devices that achieve it are auxiliary. This talk will report on our progress toward developing mathematical foundations that attempt to bring the human-centered sciences of perceptual psychology, neuroscience, and physiology closer to core engineering principles by viewing the design and delivery of illusions as a coupled dynamical system. The system is composed of two interacting entities: The organism and its environment, in which the former may be biological or even an engineered robot. Our vision is that the research community will one day have principled engineering approaches to design, simulation, prediction, and analysis of sustained, targeted perceptual experiences. It is hoped that this direction of research will offer valuable guidance and deeper insights into VR, robotics, graphics, and possibly the biological sciences that study perception. This work is supported by an ERC Advanced Grant (ILLUSIVE).

Biographical Note

Steven M. LaValle is Professor of Computer Science and Engineering, in Particular Robotics and Virtual Reality, at the University of Oulu. Since 2001, he has also been a professor in the Department of Computer Science at the University of Illinois. He has also held positions at Stanford University and Iowa State University. His research interests include robotics, virtual and augmented reality, sensing, planning algorithms, computational geometry, and control theory. In research, he is mostly known for his introduction of the Rapidly exploring Random Tree (RRT) algorithm, which is widely used in robotics and other engineering fields. In industry, he was an early founder and chief scientist of Oculus VR, acquired by Facebook in 2014, where he developed patented tracking technology for consumer virtual reality and led a team of perceptual psychologists to provide principled approaches to virtual reality system calibration, health and safety, and the design of comfortable user experiences. From 2016 to 2017 he was Vice President and Chief Scientist of VR/AR/MR at Huawei Technologies, Ltd. He has authored the books Planning Algorithms, Sensing and Filtering, and Virtual Reality. He currently leads an Advanced Grant from the European Research Council on the Foundations of Perception Engineering. More information: http://lavalle.pl

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Keynote

Oversharing in Virtual Reality: What does our motion reveal about us?

Rachel McDonnell
Trinity College Dublin

Abstract

In the early 1970s, psychologists investigated biological motion perception by attaching point-lights to the joints of the human body, known as 'point light walkers'. These early experiments showed biological motion perception to be an extreme example of sophisticated pattern analysis in the brain, capable of easily differentiating human motions with reduced motion cues. Further experiments showed that biological motion is rich in psychological information such as social categories, emotional state, intentions, and underlying dispositions. Nowadays, motion data from reduced cues is routinely tracked using motion capture systems or even VR headsets and controllers and applied to virtual avatars in immersive virtual environments. This data contains psychological information that could be extracted, stored or even shared. In this talk, I will discuss research that I have conducted over the years on the perception of full-body motion capture and the effect of applying it to different avatar morphologies – ranging from photorealistic virtual humans to flesh-eating zombies! I will also discuss the implications for avatar-based interactions in immersive virtual worlds, as technology develops, and motion capture data becomes more accessible to all.

Biographical Note

Rachel McDonnell is an Associate Professor of Creative Technologies at Trinity College Dublin, Ireland. Her research focusses on animation of virtual characters, using perception to both deepen our understanding of how virtual characters are perceived, and directly provide new algorithms and guidelines for industry developers on where to focus their efforts. She has published over 100 papers in conferences and journals in her field, including many top-tier publications at venues such as SIGGRAPH, Eurographics, and IEEE TVCG, etc. She serves as Associate Editor on journals such as ACM Transactions on Applied Perception and Computer Graphics Forum, and is a regular member of many international program committees (including ACM SIGGRAPH and Eurographics). More information: https://www.scss.tcd.ie/Rachel.McDonnell

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Keynote

Learning Motion-guided Dynamic Garment Details

Niloy J. Mitra
University College London (UCL)

Abstract
Realistic dynamic garments on animated characters have many AR/VR applications. While authoring such dynamic garment geometry is still a challenging task, data-driven simulation provides an attractive alternative, especially if it can be controlled simply using the motion of the underlying character. Over the last few years, we have developed deep learning methods to generate wrinkles, neural garments, and motion-guided dynamic 3D garments, especially loose garments. We focus on taking inspiration from classical garment simulation literature and learning data priors that generalize to new body shapes, motion types, and garment dimensions. In this talk, I will describe our findings and discuss open challenges in this area.

Biographical Note
Niloy J. Mitra leads the Smart Geometry Processing group in the Department of Computer Science at University College London and the Adobe Research London Lab. He received his PhD from Stanford University under the guidance of Leonidas Guibas. His current research focuses on developing machine learning frameworks for generative models for high-quality geometric and appearance content for CG applications. Niloy received the 2019 Eurographics Outstanding Technical Contributions Award, the 2015 British Computer Society Roger Needham Award, and the 2013 ACM SIGGRAPH Significant New Researcher Award. He was elected as a fellow of Eurographics in 2021 and the SIGGRAPH Technical Papers Chair 2022. Besides research, Niloy is an active DIYer and loves reading, cricket, and cooking. More information: http://geometry.cs.ucl.ac.uk

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Keynote

Future Animation Systems

Daniel Holden
Principal Animation Programmer Epic Games

Abstract
Ten years ago, the ideas behind Physically Based Animation began to revolutionize rendering - not through specific methods or implementations - but via the philosophy they implied. I believe that if we want to build animation systems of the future we need to go through a similar philosophical shift. In this talk I will discuss some of the lessons we can learn from this history of rendering, what challenges (and advantages) we have that are unique to animation, and how some of my previous research has tried to both tackle these challenges and exploit the advantages to get us closer to that future.

Biographical Note
Daniel Holden is a Principal Animation Programmer at Epic Games doing research and development on animation in the Unreal Engine. Before this he worked at Ubisoft's industrial research lab "La Forge", developing techniques using Machine Learning in various areas of video game development such as animation and physics. He completed his PhD at The University of Edinburgh in 2017 with work focused on the use of neural networks and machine learning for character animation. His research has been presented at a number of conferences including SIGGRAPH, SIGGRAPH Asia, and GDC. More information: https://theorangeduck.com