Lecture Notes in Computer Science 10700

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Virtual Reality and Augmented Reality

14th EuroVR International Conference, EuroVR 2017
Laval, France, December 12–14, 2017
Proceedings

Springer

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Preface

We are pleased to present in this LNCS volume the Scientific and Technical papers of EuroVR 2017, the 14th annual EuroVR conference, which took place at the Laval Virtual Center (France) during December 12–14, 2017.

Prior to this year, the EuroVR conference was held at Bremen (2014), Lecco (2015), and Athens (2016). This series was initiated in 2004 by the INTUITION Network of Excellence in Virtual and Augmented Reality, supported by the European Commission until 2008, and incorporated within the Joint Virtual Reality Conferences (JVRC) from 2009 to 2013. The focus of the EuroVR conferences is to present, each year, novel virtual reality (VR) and mixed reality (MR) technologies, including software systems, display technologies, interaction devices, and applications, to foster engagement between industry, academia, and the public sector, and to promote the development and deployment of VR/AR technologies in new, emerging, and existing fields.

This annual event of the EuroVR association (https://www.eurovr-association.org/) provides a unique platform for exchange between researchers, technology providers, and end users around commercial or research applications. Along with the scientific and technical sessions comprising the research papers of this LNCS volume, industry-oriented sessions were also organized to report a number of use cases and applications of VR/AR technologies in multiple fields (automotive, medical, etc.). In addition, poster and demo sessions were held to allow discussions around several works in progress.

EuroVR 2017 was a very special issue of our annual conference, because it was the first year that we collaborated with Springer to publish the papers of the scientific and technical track of our annual conference. To increase the excellence of this applied research conference, which is basically oriented toward new uses of VR and AR technologies, we created a set of committees including an International Program Committee (IPC).

This IPC selected 12 papers for the scientific/technical track of EuroVR 2017, which are gathered in this LNCS volume. Ten full papers and two short papers were selected from 36 submissions, resulting in an acceptance rate of 33%. Each paper was reviewed by three members of the IPC with the help of some external expert reviewers. From the review reports, the final decision was taken by the IPC co-chairs, with the participation of one of the general conference co-chairs. Moreover, a few rejected papers were redirected to the industrial, poster, or demo tracks, based on the recommendation of the reviewers.

The selected papers are organized in four topical parts: Interaction Models and User Studies, Visual and Haptic Real-Time Rendering, Perception and Cognition, and Rehabilitation and Safety. This volume also includes the keynote abstracts of the invited speakers of EuroVR 2017: Martin Courchesne (CEA LIST, France), Philippe Gelin (European Commission, Luxembourg), Anatole Lécuyer (Hybrid, Inria, France),

Wendy Powell (University of Portsmouth, UK), and Frank Steinicke (University of Hamburg, Germany).

We would like to thank the members of the IPC and the external reviewers for their insightful reviews, which ensured the high quality of the papers selected for the scientific/technical track. Furthermore, we would like to thank the industrial co-chairs, the poster/demo co-chairs, and the local organizers of the Laval Virtual Center.

We are especially grateful to Anna Kramer (Assistant Editor, Computer Science Editorial of Springer) and Volha Shaparava (Springer OCS Support) for their support and advice during the preparation of this LNCS volume.

November 2017

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Organization

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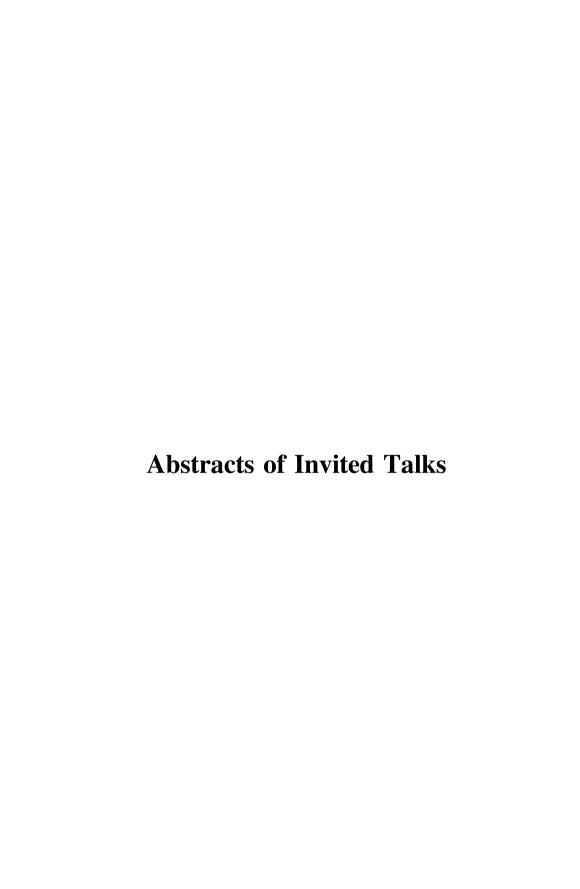Maximilian Kaluschke   Jean-Marc Vezien
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Abstracts of Invited Talks

Interactive Physics Simulation for Virtual Technologies

Martin Courchesne

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Between fun video game physics to useful high-fidelity physics simulation, there is a whole range of models, numerical methods and computational resources. Now what is it possible to achieve today in term of realism when restricted to real-time performance for human in the loop physics-based simulation? Keeping in mind general consumer market, how much recent progress in CPU and GPU hardware is helping us achieving our goals and at what price.

So in this talk I will be talking about the evolution and uses of interactive physics simulation and my vision of where this is going together with the emerging Virtual, Mixed and Augmented Reality technologies. How does this reflect with the new generation internet and the ability to extend physics interaction to include other human in the same loop?

Martin Courchesne is a project manager and research engineer at CEA Tech (French Atomic Energy and Alternative Energy Commission) in the Interactive Simulation and Virtual Reality laboratory. Starting with a degree in optical physics, Mr. Courchesne spent the last 25 years working and researching on physics simulation engines for real-time interactive application. From simulating cloth and hair as a research assistant at university of Geneva, to creating a collection of physics-based engines for the video game industry, he then spent over 10 years at CM-Labs simulations where he was a major contributor to the Vortex simulation engine. After an additional 5 years as founder and CEO at Simwat Simulations he finally joined the CEA Tech a year ago where he is involved in several projects related to the use of physics simulation in industrial and health applications.

H2020 and Its New Actions in Interactive Technologies

Philippe Gelin

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Horizon 2020 is the European Union framework programs funding research and innovation. Within its future plan for 2018–2020, the part addressing information and communication technologies foresee funding to support the European academic research as well as its industry in the fast moving domain of interactive technologies which include Virtual Reality

During the session, I will first present the rational and details of the planned actions as well the concrete steps toward fund granting.

Philippe Gélin is a Policy and Project Officer working for the European Commission since 2002.

Electrical engineer with a major in Artificial Intelligence, he has received his PhD from the Ecole Polytechnique Fédérale de Lausanne for his work in "Keyword Spotting for Video Indexing" and has worked for multinational companies as well as start-ups before entering the European Commission where he developed policies and monitored projects in the areas of Human Language Technologies, Human Machine Interfaces, Cognition, Robotics, Automatic Translation, Emotional Computing, Creativity and most recently Augmented and Virtual Reality.

Touching with the Eyes: A Story
of Pseudo-haptics

Anatole Lécuyer

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The sense of touch is an essential component of the user's immersive experience when interacting in virtual reality. There exist many ways, and numerous sophisticated mechatronic devices for simulating touch or haptic sensations in virtual environments. The "pseudo-haptic feedback" represents an alternative approach, meant to simulate haptic sensations without necessarily relying on a dedicated device, but exploiting relatively simple visual effects instead. In this talk we will provide a global perspective about this alternative path, coming back to its origin, presenting its conceptual foundations and its main characteristics, and giving representative examples of implementation in various contexts such as 2D interaction with images or immersive 3D user interfaces.

Anatole Lécuyer is Senior Researcher and Head of Hybrid research team, at Inria, the French National Institute for Research in Computer Science and Control, in Rennes, France. His research interests include Virtual Reality, Haptic Interaction, 3D User Interfaces, and Brain-Computer Interfaces. He regularly serves as expert in Virtual Reality for public bodies such as European Commission or French National Research Agency. He is currently Associate Editor of "Frontiers in Virtual Environments" and "Presence" journals. He was Program co-Chair of the IEEE Virtual Reality Conference (2015–2016) and Conference co-Chair of the IEEE 3DUI Symposium (2012–2013) and the IEEE ISMAR Conference (2017). He is a former secretary of the IEEE Technical Committee on Haptics. Anatole Lécuyer obtained the Inria-French Academy of Sciences Young Researcher Prize in 2013.

The Good, the Bad and the Better: Opportunities and Risks in Virtual Rehabilitation

Wendy Powell

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The moment we connect with virtual reality, our perception and behaviour alters as we interact with the digital world. We are seeing growing numbers of VR applications which claim to offer positive benefits for our minds and bodies, but there has also been much speculation about the risks and side effects of virtual reality. While high-end VR systems have been used for years to assist in physical and emotional rehabilitation, the rising popularity of consumer level VR is raising issues such as nausea, sickness and potential injury.

In this talk I will discuss the potential benefits offered by VR, as well as some of the common pitfalls and mistakes. Finally I will explore design approaches which are important for effective and commercially successful VR Rehabilitation development.

Dr Wendy Powell is a Reader in Virtual Reality at the University of Portsmouth and a subject matter expert in the engineering of virtual reality systems, with 12 years experience in creating and studying virtual environments and interactive applications. She directs the Virtual Interactions and Applications Research Group at the University of Portsmouth and is also Deputy Director of the Centre for Health Modelling and Informatics. Dr Powell is a VR Technical Expert for, and Senior Member of the Institute of Electrical and Electronics Engineers (IEEE). Wendy has a particular research interest in the way in which VR alters our perception and behaviour, and implications for the design of VR for rehabilitation.

The Four S's of the Next User Interface Paradigm for VR: Spatial, Supernatural, Social and Smart

Frank Steinicke

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The notion of a computer-mediated or virtual reality, in which synthetic objects or the entire virtual environment get indistinguishable from the real world, dates back to Plato's "The Allegory of the Cave" and has been reconsidered again and again in science fiction literature as well as the movie industry. For instance, virtual reality is often used to question whether we truly "know" if our perceptions are real or not. Early science fiction movies like "The Matrix" or the fictional holodeck from the Star Trek universe are prominent examples of these kind of perceptual ambiguities. Furthermore, in movies like Steven Spielberg's "Minority Report", Jon Favreau's "Iron Man", or Brad Bird's "Mission Impossible 4" actors can seamlessly use free-hand gestures in space combined with speech to manipulate 3D holographic projections, while they also perceive haptic feedback when touching virtual objects.

In my talk I will revisit some of the most visually impressive 3D user interfaces and experiences, and discuss their benefits and drawbacks. Finally, I will argue that successful user interfaces for the next human-computer interaction paradigm need to be spatial, supernatural, social and smart.

Frank Steinicke is a professor for Human-Computer Interaction at the Department of Informatics at the University of Hamburg. His research is driven by understanding the human perceptual, cognitive and motor abilities and limitations in order to reform the interaction as well as the experience in computer-mediated realities. Frank Steinicke regularly serves as panelist and speaker at major events in the area of virtual reality and human-computer interaction and is on the IPC of various national and international conferences. He serves as the program chair for IEEE VR 2017/2018. Furthermore, he is a member of the Steering committee of the ACM SUI Symposium and the GI SIG VR/AR, and currently editor of the IEEE Computer Graphics & Applications Department on Spatial Interfaces.

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