



14th Workshop on Virtual Reality Interactions and Physical Simulations

**Delft, The Netherlands
April 15 – 16, 2018**

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Preface

The workshop on Virtual Reality Interactions and Physical Simulations (VRIPHYS) is one of the well-established international conferences in computer animation and virtual reality. The goal of this workshop is to attract high-quality research papers in the domains of dynamic simulation and physical interaction in virtual reality environments. We also welcome papers showing on-going research with promising results and new technology with applications of related focus.

Since 2004, this annual workshop has provided an opportunity for researchers in computer animation and virtual reality to present and discuss their latest results, and to share ideas for potential directions of future research. The first workshop was held in Colima (Mexico), followed by successful venues in Pisa (Italy), Madrid (Spain), Dublin (Ireland), Grenoble (France), Karlsruhe (Germany), Copenhagen (Denmark), Lyon (France), Darmstadt (Germany), Lille (France) and Bremen (Germany).

In 2018, the 14th VRIPHYS is organized in cooperation with Eurographics (EG), and is co-located for the second time with the EG2018 conference in Delft. The workshop takes place on April 15-16, 2018, with a technical program comprising full papers, posters, or short presentations of work in progress. Members of the International Program Committee (IPC) have reviewed the submitted full papers. Each paper has been evaluated at least by 3 experts. The submission review management system (SRMv2) was provided by EG. The workshop proceedings are published in the EG Digital Library.

In addition, high-level academic and industrial keynotes will serve to further enlighten the workshop, namely: Alessandro TASORA (Univ. of Parma), Moritz BÄCHER (Disney Research), François FAURE (Anatoscope), Erwin COUMANS (Google Brain Team) and Xavier MERLHIOT (CEA). We would like to thank them very much for accepting our invitation.

The organizing committee would like to acknowledge the continuous and great help of S. Behnke for handling numerous questions regarding the submission and publication procedures. Finally, we would like to thank all members of the IPC and reviewers board for the very constructive and timely reviews, and special thanks to the members of the Steering Committee for their valuable help and advice.

The General Chairs of VRIPHYS 2018:

Sheldon Andrews, École de technologie supérieure, Montréal, Canada
Kenny Erleben, University of Copenhagen, Denmark
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Disney Research, Los Angeles, California & Zürich, Switzerland

Disney Research's mission is to drive value for The Walt Disney Company by delivering scientific & technological innovation Company-wide. Our world-class research talent invents and transfers the most compelling technologies enabling the Company to differentiate its content, services, and products. Our world class research teams in Los Angeles and Zürich focus onto variety of research applications including Visual Computing, Machine Intelligence, Robotics, Human Computer Interaction, and Digital Fabrication.



Gold Sponsor: CM Labs Simulations, Montreal, QC, Canada

CM Labs builds simulation-based solutions to help clients design advanced equipment and prepare for skilled operations. Through its Vortex Studio platform, CM Labs provides capabilities for training simulators, mission rehearsal, serious games, virtual prototyping, and testing. Today, CM Labs is the leading vendor for simulation-based training in the construction industry.



Bronze Sponsor: Haption, France

Haption designs, manufactures and sells hardware and software solutions based on force-feedback. Founded in 2001, the company partners with the most advanced leaders to provide professional level force-feedback solutions for medical, robotic, nuclear and industrial applications. Haption is widely acknowledged for its Virtuose range. Available with 6 degrees of freedom, they provide 3 or 6 force feedback along translations and rotations, in Standard and Desktop format. Involved in different R&D projects, we keep pushing the technology to market new products. In a 10-year stage, 5 new products were developed and industrialized, some of which are still unique today (Able, Scale1).



Bronze Sponsor: BeamNG, Bremen, Germany

Since its establishment in 2013, BeamNG managed to become an international indie gaming studio with a diverse team of over 30 people. With our headquarter being located in Bremen, Germany, we additionally have experts working from many different parts of the world. The people working for BeamNG are our most valuable asset and to support them in their creative work is very important to us. Our team members are passionate about what they're doing and together we are able to push the boundaries of what is possible in the simulation world. Our proximity to the university campus allows us to enrich our team with talented students and offer them an insight into the practical work of a gaming studio. Student events like the Open Night of Code or the Global Game Jam are a great way to connect and we actively try to participate and support these events each year.



Hosted by TU Delft / CGV Group

The CGV group at Delft University of Technology works on many topics in rendering, visualization of (scientific) information and modelling of 3D objects. Our goal is to develop new algorithms to generate, represent, interpret, display and interact with data. In particular, complex and large data sets are in our focus, as they play an increasingly important role in many scientific, medical and engineering applications.



In Cooperation with Eurographics Association

Eurographics is the only truly Europe-wide professional Computer Graphics association. The association supports its members in advancing the state of the art in Computer Graphics and related fields such as Multimedia, Scientific Visualization and Human Computer Interfaces. Through a world-wide membership, EG maintains close links with developments in the US, Japan and other countries, promoting the exchange of scientific and technical information and skills on a global scale.

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Keynote Presentation

Challenges and Emerging Applications in Large Scale Multibody System Dynamics

Alessandro Tasora
Università di Parma

Abstract

The simulation of physical systems involving a large number of colliding objects represents an open research topic in non-smooth dynamics. Solving for unknown reaction forces between thousands of contacting objects is a major numerical bottleneck still nowadays: the state of the art methods consist in casting the problem as a measure differential inclusion that requires the solution of high-dimensional variational inequalities at each time step. We will discuss some recent classes of iterative solvers, their benefits and drawbacks, and we will show some possible improvements in this area. We will also discuss how to introduce flexible parts (beams, shells, solids) in a unified framework for non-smooth contact dynamics. Challenging applications will be presented, ranging from granular flows to massive robotics, collapses in masonry structures, watch design and machine-ground interaction.

Keynote Presentation

Breathing Life into Physical Characters with Computation

Moritz Bächer

Disney Research Zurich

Abstract

Stimulated by advances in manufacturing, fabrication-oriented design has gained an increasing level of interest from the graphics community. With modern manufacturing technologies, we can build physical characters of nearly unbounded complexity by shifting the design burden to computational approaches.

In contrast to CG characters, physical characters have to obey the laws of physics, making their design a challenging task. In this talk, I will discuss several strategies that aid in navigating complex design spaces, identifying optimal values for discrete and continuous design parameters, and safeguarding against physically infeasible designs. I will illustrate how we can put these strategies into practice and breathe life into rigid, articulated, mechanical, or deformable characters and in the process shield the user from the complexity of the design task.

Industrial Talk

Computer Graphics from Entertainment to Personalized Healthcare Design

François Faure

Anatoscope

Abstract

Character design, animation and simulation has been intensively studied in Computer Graphics to populate video games and movies. In this talk we show that applications of such techniques range far beyond entertainment, and can significantly impact healthcare design. We discuss examples based on the work of Anatoscope, a start-up founded in 2015 founded by researchers in Computer Graphics and related domains, to model patients based on medical imaging and design personalized orthopedics.

Industrial Talk

Bridging the Reality Gap in Robot Locomotion Using Deep Learning

Erwin Coumans
Google Brain Team

Abstract

Deep Learning is making great progress in speech and image recognition, machine translation and there is potential beyond computing in areas such as art and music and robotics. This talk discusses our steps in the journey going from traditional model-based physics simulation, system identification and hand-engineered controls for robotic locomotion towards the use of deep learning.

Industrial Talk

Industrial Applications of Interactive Simulation: Beyond Operator Training

Xavier Merlhiot and Martin Courchesne

CEA

Abstract

Many systems still have human operators commanding them, for example in the offshore installation domain where several operators must coordinate their actions to accomplish complex and risky tasks. The industrial stakes of interactive simulations of these systems, in the sense of having Humans In the Loop, thus extend far beyond operator training, and especially cover risk assessment, operation planning and optimization, and mission rehearsal. For these applications, not only the environment, but also the actuators, sensors, control laws, and performance limits of the operated systems should be reproduced accurately.

Based on past and present use-cases of the XDE Physics simulation kernel developed at CEA, we will discuss how the selective re-implementation of numerical approaches traditionally found in offline tools may be incorporated in real-time HuIL simulations and help in reaching higher levels of accuracy and robustness.