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Université de Grenoble Alpes

Activity Report 2019

Project-Team IMAGINE

Intuitive Modeling and Animation for Interactive Graphics & Narrative Environments

IN COLLABORATION WITH: Laboratoire Jean Kuntzmann (LJK)

RESEARCH CENTER
Grenoble - Rhône-Alpes

THEME
Interaction and visualization

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Project-Team IMAGINE

Creation of the Team: 2012 January 01, updated into Project-Team: 2013 January 01

Keywords:

Computer Science and Digital Science:

A5. - Interaction, multimedia and robotics
A5.5. - Computer graphics
A5.5.1. - Geometrical modeling
A5.5.3. - Computational photography
A5.5.4. - Animation
A5.6. - Virtual reality, augmented reality
A5.7. - Audio modeling and processing
A9.3. - Signal analysis

Other Research Topics and Application Domains:

B2. - Health
B2.2. - Physiology and diseases
B3. - Environment and planet
B3.3. - Geosciences
B5. - Industry of the future
B5.2. - Design and manufacturing
B5.7. - 3D printing
B9.1. - Education
B9.2.2. - Cinema, Television
B9.2.3. - Video games
B9.2.4. - Theater
B9.6.6. - Archeology, History

1. Team, Visitors, External Collaborators

Research Scientists

Remi Ronfard [Team leader, Inria, Senior Researcher, HDR]
Melina Skouras [Inria, Researcher]

Faculty Members

Stefanie Hahmann [Institut polytechnique de Grenoble, Professor, HDR]
Jean-Claude Léon [Institut polytechnique de Grenoble, Professor, until Apr 2019, HDR]
Olivier Palombi [Univ Grenoble Alpes, Associate Professor, HDR]

Post-Doctoral Fellow

Musaab Khalid Osman Mohammed [Institut polytechnique de Grenoble, Post-Doctoral Fellow, until Apr 2019]

PhD Students

Amelie Fondevilla [Univ. Grenoble Alpes, PhD student, until Nov 2019]
Thomas Buffet [Inria, PhD Student]
Pierre Casati [Inria, PhD Student]

Qianqian Fu [Univ Grenoble Alpes, PhD Student]
Geoffrey Guingo [Univ de Strasbourg, PhD Student, until Aug 2019]
Youna Le Vaou [Cifre Groupe PSA, PhD Student]
Vaishnavi Ameya Murukutla [Univ Grenoble Alpes, PhD Student]

Technical staff

Remi Colin de Verdiere [Inria, Engineer]
Valerian Daunis [Inria, Engineer, from Mar 2019 until Apr 2019]
Julien Daval [Inria, Engineer, until Apr 2019]

Interns and Apprentices

Gillian Borrell [Univ Grenoble Alpes, from Apr 2019 until Jun 2019]
Melanie Carriere [Inria, from Feb 2019 until Jul 2019]
Shalu Dwivedi [Institut polytechnique de Grenoble, from Feb 2019 until Jul 2019]
Paul Elian Tabarant [Inria, until Jul 2019]
Marion Taconne [Univ Grenoble Alpes, from Jul 2019 until Sep 2019]
Manon Vialle [Institut polytechnique de Grenoble, from Feb 2019 until May 2019]

Administrative Assistant

Marion Ponsot [Inria, Administrative Assistant]

2. Overall Objectives

2.1. Context

With the fast increase of computational power and of memory space, increasingly complex and detailed 3D content is expected for virtual environments. Unfortunately, 3D modeling methodologies did not evolve as fast: most users still use standard CAD or 3D modeling software (such as Maya, 3DS or Blender) to design each 3D shape, to animate them and to manually control cameras for movie production. This is highly time consuming when large amounts of detailed content need to be produced. Moreover the quality of results is fully left in the user's hand, which restricts applicability to skilled professional artists. More intuitive software such as Z-Brush are restricted to shape design and still require a few months for being mastered by sculpture practitioners. Reducing user load can be done by capturing and re-using real objects or motions, at the price of restricting the range of possible content. Lastly, procedural generation methods can be used in specific cases to automatically get some detailed, plausible content. Although they save user's time, these procedural methods typically come at the price of control: indirect parameters need to be tuned during a series of trial and errors until the desired result is reached. Stressing that even skilled digital artists tend to prefer pen and paper than 3D computerized tools during the design stages of shapes, motion, and stories, Rob Cook, vice president of technology at Pixar animation studios notoriously stated (key-note talk, Siggraph Asia 2009): *new grand challenge in Computer Graphics is to make tools as transparent to the artists as special effects were made transparent to the general public*. This remains true ten years later.

Could digital modeling be turned into a tool, even more expressive and simpler to use than a pen, to quickly convey and refine shapes, motions and stories? This is the long term vision towards which we would like to advance.

2.2. Scientific goals

The goal of the IMAGINE project is to develop **a new generation of models, algorithms and interactive environments for the interactive creation of animated 3D content and its communication through virtual cinematography**.

Our insight is to revisit models for shapes, motion, and narration from a user-centred perspective, i.e. to give models an intuitive, predictable behaviour from the user's view-point. This will ease both semi-automatic generation of animated 3D content and fine tuning of the results. The three main fields will be addressed:

1. **Shape design**: We aim to develop intuitive tools for designing and editing 3D shapes and their assemblies, from arbitrary ones to shapes that obey application-dependent constraints - such as, for instance, developable surfaces representing cloth or paper, or shape assemblies used for CAD of mechanical prototypes.
2. **Motion synthesis**: Our goal is to ease the interactive generation and control of 3D motion and deformations, in particular by enabling intuitive, coarse to fine design of animations. The applications range from the simulation of passive objects to the control of virtual creatures.
3. **Narrative design**: The aim is to help users to express, refine and convey temporal narrations, from stories to educational or industrial scenarios. We develop both virtual direction tools such as interactive storyboarding frameworks, and high-level models for virtual cinematography, such as rule-based cameras able to automatically follow the ongoing action and automatic film editing techniques.

In addition to addressing specific needs of digital artists, this research contributes to the development of new expressive media for 3D content. The long term goal would be to enable any professional or scientist to model and interact with their object of study, to provide educators with ways to quickly express and convey their ideas, and to give the general public the ability to directly create animated 3D content.

3. Research Program

3.1. Methodology

As already stressed, thinking of future digital modeling technologies as an Expressive Virtual Pen enabling to seamlessly design, refine and convey animated 3D content, leads to revisit models for shapes, motions and stories from a user-centered perspective. More specifically, inspiring from the user-centered interfaces developed in the Human Computer Interaction domain, we introduced the new concept of user-centered graphical models. Ideally, such models should be designed to behave, under any user action, the way a human user would have predicted. In our case, user's actions may include creation gestures such as sketching to draft a shape or direct a motion, deformation gestures such as stretching a shape in space or a motion in time, or copy-paste gestures to transfer some of the features from existing models to other ones. User-centered graphical models need to incorporate knowledge in order to seamlessly generate the appropriate content from such actions. We are using the following methodology to advance towards these goals:

- Develop high-level models for shapes, motion and stories that embed the necessary knowledge to respond as expected to user actions. These models should provide the appropriate handles for conveying the user's intent while embedding procedural methods that seamlessly take care of the appropriate details and constraints.
- Combine these models with expressive design and control tools such as gesture-based control through sketching, sculpting, or acting, towards interactive environments where users can create a new virtual scene, play with it, edit or refine it, and semi-automatically convey it through a video.

3.2. Validation

Validation is a major challenge when developing digital creation tools: there is no ideal result to compare with, in contrast with more standard problems such as reconstructing existing shapes or motions. Therefore, we had to think ahead about our validation strategy: new models for geometry or animation can be validated, as usually done in Computer Graphics, by showing that they solve a problem never tackled before or that they provide a more general or more efficient solution than previous methods. The interaction methods we are developing for content creation and editing rely as much as possible on existing interaction design principles already validated within the HCI community. We also occasionally develop new interaction tools, most often in collaboration with this community, and validate them through user studies. Lastly, we work with expert users from various application domains through our collaborations with professional artists, scientists from other domains, and industrial partners: these expert users validate the use of our new tools compared to their usual pipeline.

4. Application Domains

4.1. Target applications

Our research can be applied to any situation where users need to create new, imaginary, 3D content. Our work should be instrumental, in the long term, for the visual arts, from the creation of 3D films and games to the development of new digital planning tools for theater or cinema directors. Our models can also be used in interactive prototyping environments for engineering. They can help promoting interactive digital design to scientists, as a tool to quickly express, test and refine models, as well as an efficient way for conveying them to other people. Lastly, we expect our new methodology to put digital modeling within the reach of the general public, enabling educators, media and other practitioners to author their own 3D content.The diversity of users these domains bring, from digital experts to other professionals and novices, gives us excellent opportunities to validate our general methodology with different categories of users. Our ongoing projects in these various application domains are listed in Section 7.

4.2. Visual arts

- Sculpture.
- Modeling and animation for 3D films and games.
- Virtual cinematography and tools for theater directors.

4.3. Engineering

- Industrial design.
- Mechanical & civil engineering.

4.4. Natural sciences

- Geology.
- Virtual functional anatomy.

4.5. Education and creative tools

- Sketch-based teaching.
- Creative environments for novice users.
- Museography.

5. Highlights of the Year

5.1. Highlights of the Year

Maxime Garcia, Amélie Fondevilla and Geoffrey Guingo defended their PhD theses.

We published two papers [16], [20] at ACM Transaction on Graphics (Proceedings of SIGGRAPH) which is the most prestigious and selective conference in computer graphics.

5.1.1. Awards

Mélina Skouras was elected Eurographics Junior Fellow in May 2019.
Stefanie Hahmann was elected SMA Fellow (Solid Modeling Association) in June 2019.

6. New Software and Platforms

6.1. MyCF

My Corporis Fabrica

KEYWORDS: 3D modeling - Simulation - Health - Ontologies - Anatomy - Patientspecific - Medical imaging

FUNCTIONAL DESCRIPTION: Knowledge-based 3D anatomical modeling using MyCF The MyCF software eases the creation of 3D anatomical models for visualization and mechanical simulation. As input, the user provides a list of anatomical entities or functions to simulate, using keywords or navigating in reference 3D model. As output, she gets a 3D model ready to visualize, or to simulate.

- Participants: Ali Hamadi Dicko, Federico Ulliana, François Faure and Olivier Palombi
- Partner: Université Joseph-Fourier
- Contact: Olivier Palombi

6.2. Kino AI

Artificial intelligence for cinematography

KEYWORDS: Video analysis - Post-production

FUNCTIONAL DESCRIPTION: Kino AI is an implementation of the method described in our patent "automatic generation of cinematographic rushes using video processing". Starting from a single ultra high definitiion (UltraHD) recording of a live performance, we track and recognize all actors present on stage and generate one or more rushes suitable for cinematographic editing of a movie.

- Partner: IIIT Hyderabad
- Contact: Rémi Ronfard
- Publications: Multi-Clip Video Editing from a Single Viewpoint - Zooming On All Actors: Automatic Focus+Context Split Screen Video Generation

6.3. Platforms

6.3.1. RUMBA

RUMBA is a next-generation 3D animation software targeted to professional animation studios, developed jointly by Mercenaries Engineering, TEAMTO and IMAGINE. Development was funded in part by FUI projects COLLODI 1 and COLLODI 2. RUMBA has been used in production by TEAMTO since 2017. We are using RUMBA as a platform for developing new algorithms in sketch-based animation, based on our previous work during Martin Guay's PhD thesis. This includes many improvements to allow those methods to work in a professional workflow.

6.3.2. Sky Engine

Sky Engine is a realtime game engine developped by Maxime Garcia as part of his PhD thesis, which incorporates several shape modleing and animation tools developped within the team. It is hoped that it will supersede Expressive as a platform for future integration of research results of the team involving real-time, story-driven shape modeling, animation and cinematography.

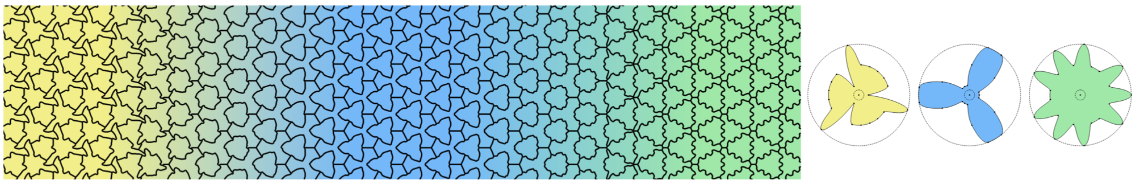

Figure 1. Our method generates a smoothly-graded pattern (left) when interpolating between three star-shaped distance functions (right) on a regular honeycomb lattice. Each distance function is compactly parameterized with polar coordinates, allowing for simple interpolation in metric space as indicated by color-coding.

7. New Results

7.1. Star-Shaped Metrics for Mechanical Metamaterial Design

We present a method for designing mechanical metamaterials based on the novel concept of Voronoi diagrams induced by star-shaped metrics. As one of its central advantages, our approach supports interpolation between arbitrary metrics, as depicted in Figure 1. This capability opens up a rich space of structures with interesting aesthetics and a wide range of mechanical properties, including isotropic, tetragonal, orthotropic, as well as smoothly graded materials. We evaluate our method by creating large sets of example structures, provided as accompanying material. We validate the mechanical properties predicted by simulation through tensile tests on a set of physical prototypes.

7.2. Computational Design of Fabric Formwork

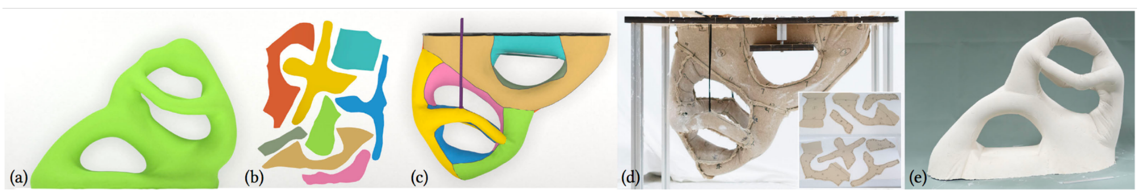

Figure 2. A fertility model designed and fabricated using our computational approach. For a target 3D model (a), our system can automatically compute a set of flat panels (b) that can be sewn together to serve as fabric containers to form a target shape by pressure of liquid plaster poured in – see (c) for the simulation under force equilibrium of membrane tension, liquid pressure and external supports. The generated flat panels are used to conduct the physical fabrication of fabric formwork (d). After drying and unwrapping the fabric container, a sculpture with the designed target shape has been fabricated (e).

This work (illustrated in Figure 2) presents an inverse design tool for fabric formwork - a process where flat panels are sewn together to form a fabric container for casting a plaster sculpture. Compared to 3D printing techniques, the benefit of fabric formwork is its properties of low-cost and easy transport. The process of fabric formwork is akin to molding and casting but having a soft boundary. Deformation of the fabric container is governed by force equilibrium between the pressure forces from liquid fill and tension in the stretched fabric. The final result of fabrication depends on the shapes of the flat panels, the fabrication orientation and the placement of external supports. Our computational framework generates optimized flat panels and fabrication orientation with reference to a target shape, and determines effective locations for external supports. We demonstrate the function of this design tool on a variety of models with different shapes and topology. Physical fabrication is also demonstrated to validate our approach.

7.3. Spatial Motion Doodles

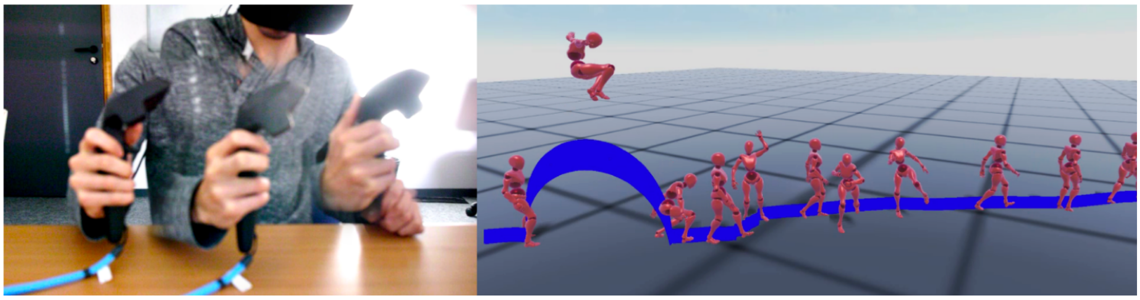

Figure 3. Left: A user drawing a spatial motion doodle (SMD) which is the six-dimensional trajectory of a moving frame (position and orientation), here attached to the HTC Vive controller. Right: The SMD is parsed into a string of motion tokens,allowing to recognize actions and extract the associated motion qualities. This information is transferred to an articulated character to generate an expressive 3D animation sequence.

We present a method for easily drafting expressive character animation by playing with instrumented rigid objects (see Figure 3). We parse the input 6D trajectories (position and orientation over time) – called spatial motion doodles – into sequences of actions and convert them into detailed character animations using a dataset of parameterized motion clips which are automatically fitted to the doodles in terms of global trajectory and timing. Moreover, we capture the expressiveness of user-manipulation by analyzing Laban effort qualities in the input spatial motion doodles and transferring them to the synthetic motions we generate. We validate the ease of use of our system and the expressiveness of the resulting animations through a series of user studies, showing the interest of our approach for interactive digital storytelling applications dedicated to children and non-expert users, as well as for providing fast drafting tools for animators.

7.4. Text-to-Movie Authoring of Anatomy Lessons

With popular use of multimedia and 3D content in anatomy teaching there is a need for a simple yet comprehensive tool to create and edit pedagogical anatomy video lessons. This work introduces an automated video authoring tool (shown in Figure 4) created for teachers. It takes text written in a novel domain specific language (DSL) called the Anatomy Storyboard Language (ASL) as input and translates it to real time 3D animation. Preliminary results demonstrates the ease of use and effectiveness of the tool for quickly drafting video lessons in realistic medical anatomy teaching scenarios.

7.5. Approximate Reconstruction of 3D Scenes From Bas-Reliefs

For thousands of years, bas-reliefs such as the one depicted in Figure 5 have been used to depict scenes of everyday life, mythology and historic events. Yet, the precise geometry of those scenes remains difficult to interpret and reconstruct. Over the past decade, methods have been developed for generating bas-reliefs from 3D scenes. With this work, we investigate the inverse problem of interpreting and reconstructing 3D scenes from their bas-relief depictions. Even approximate reconstructions can be useful for art historians and museum exhibit designers, as a first entry to the complete interpretation of the narratives told in stone or marble.

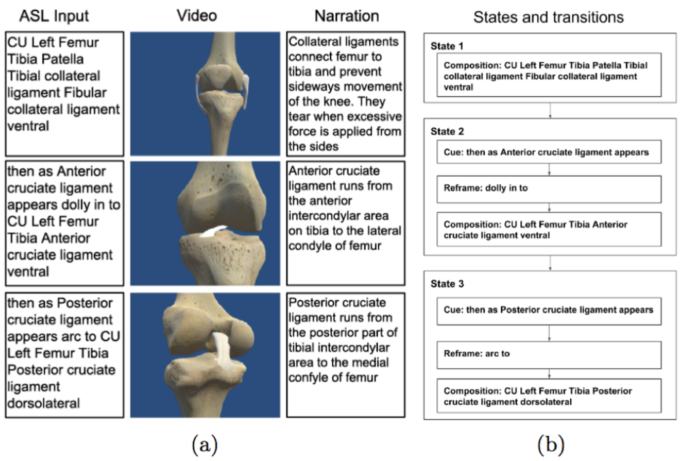

Figure 4. Text-to-movie generation example with hierarchical finite state machines representation.

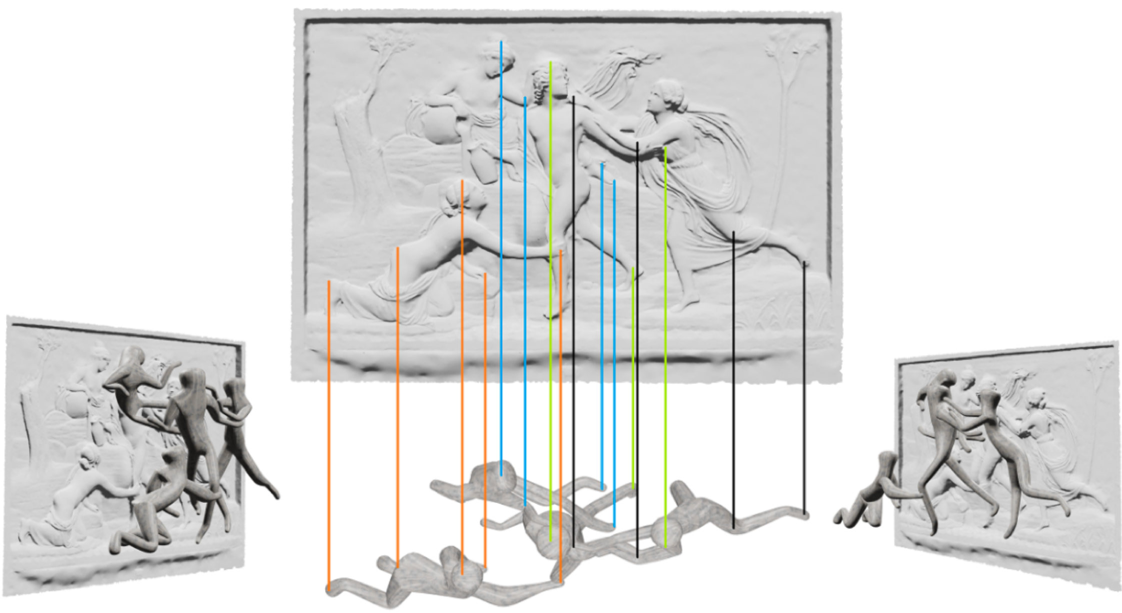

Figure 5. 3D interpretation of the mythological story of Hylas and the Water Nymphs, after a bas-relief marble by Bertel Thorvaldsen (1833). Hylas was sent to fetch water for the camp. Finding a pool in a clearing, he was encircled by water nymphs reaching up to kiss him and there disappeared with them forever. Using hand-drawn silhouette shapes and 2D skeletons of the four characters, we compute a plausible 3D reconstruction of the scene with rigged and skinned models suitable for 3D animation.

To create such approximate reconstructions, we present methods for extracting 3D base mesh models of all characters depicted in a bas-relief. We take advantages of the bas-relief geometry and high-level knowledge of human body proportions to recover body parts and their three-dimensional structure, even in severe cases of contact and occlusion. We present experimental results for 6 bas-relief depictions of Greek mythological and historical scenes involving 18 characters and draw conclusions for future work.

8. Bilateral Contracts and Grants with Industry

8.1. Bilateral Contracts with Industry

We have an ongoing CIFRE PhD contract with PSA on the topic of aesthetic shape modeling in immersive virtual reality environments, which is funding the PhD of Youna Le Vaou.

9. Partnerships and Cooperations

9.1. Regional Initiatives

9.1.1. Performance Lab (January 2018 - June 2021)

Participants: Rémi Ronfard, Qianqian Fu, Mélina Skouras, Maxime Garcia, Pierre Casati, Vaishnavi Ameya Murukutla, Rémi Colin de Verdière.

Performance Lab is a cross-disciplinary project (CDP) by IDEX Univ. Grenoble Alpes, started in January 2018, which is funding the Phd thesis of Qianqian Fu.

Conceived as an international platform, the Performance Lab brings together a community of researchers who are exploring contemporary issues that link embodiment, society and technology. The ambition of the project is to renew the ways in which research is conceived and practiced at Univ. Grenoble Alpes by developing new methods inspired by Anglo-Saxon notions of Performance as Research (PAR), research creation, practice-led and based research.

As part of the Performance Lab, IMAGINE is actively involved in the research group on "digital dramaturgies" co-led by Remi Ronfard and Julie Valero.

9.2. National Initiatives

9.2.1. InriaHub ADT Kino Ai (October 2018-September 2020)

Participants: Rémi Ronfard, Rémi Colin de Verdière, Qianqian Fu.

This two-year contract is a follow up to the one-year InriaHub ULTRAHD project which was successfully completed in December 2017. Kino Ai is a joint research project of the IMAGINE team at Inria Grenoble Alpes, and the Performance Lab at Univ. Grenoble Alpes. Following our previous work in “multiclip video editing” and “Split Screen Video Generation”, we are working to provide a user-friendly environment for editing and watching ultra-high definition movies online, with an emphasis on recordings of live performances.

The code from Vineet Gandhi’s PhD thesis was entirely re-designed for supporting ultra high definition video. The software was extensively tested in 2017 on a large dataset of 4K video recordings of theatre rehearsals, in collaboration with the Litt&Arts team at Univ. Grenoble Alpes, theatre director Jean-Francois Peyret in Paris, Theatre de l’Hexagone in Meylan and Theatre de Vidy in Lausanne. The goal of the Kino AI ADT is to allow the Kino Ai python code to run in a web server, and to provide a redesigned user interface (in javascript) running on a web client. The user interface was also designed, tested and evaluated with the Litt&Arts team at Univ. Grenoble Alpes, as part of CDP project Performance Lab.

9.2.2. FUI Collodi 2 (December 2016 - April 2019)

Participants: Rémi Ronfard, Maguelonne Beaud de Brive, Julien Daval.

This 2-year contract with two industrial partners: TeamTo and Mercenaries Engineering (software for production rendering), was a follow-up and a generalization of Dynam'it and Collodi 1. The goal was to propose an integrated software for the animation and final rendering of high-quality movies, as an alternative to the ever-ageing Maya. The project was funding 2 engineers for 2 years.

The project was extended for four additional months from January to April 2019 to allow extended expert evaluation of our sketch-based animation toolkit. Three short animations were created for this purpose by a professional animator from film examples of dancers (Gene Kelly in "Singing in the rain", Fred Astaire and Cyd Charisse in "The band wagon"). Those examples demonstrate that sketch-based animation can be used to create complex character animation even in very challenging situations. Those results were presented during the two final reviews of the COLLODI2 project in Valence and Paris in December 2019 and published as a research report.

9.2.3. FUI 3D-Oncochip (October 2018 - September 2021)

Participants: Jean-Claude Léon, Musaab Khalid Osman Mohammed.

3D-Oncochip project is a collaboration with Microlight 3D, with the objective of fabricating nanoscale 3D microtumors, which are human biological models of real tumors. This 3-year contract is funding the postdoc position of Musaab Khalid Osman Mohammed.

9.2.4. ANR E-ROMA (November 2017 - October 2020)

Participants: Rémi Ronfard, Stefanie Hahmann, Pierre Casati.

The eRoma project aims at revisiting the digitization and virtual restoration of archaeological and fine arts artefacts by taking advantage of the sites from which they were retrieved and the eras they belong to. To do so, e-Roma will develop a new virtual representation both versatile and unified enough to be used for both restoration and animation of digitized artworks. Traditional cardboard models with a fixed and rigid representation will therefore be replaced by interactive dynamic virtual prototypes, to help restore statues and illustrate changes over time.

This 3-year contract is a joint project with GeoMod team at LIRIS and the musée gallo-romain in Lyon. The contract started in November 2017 and is funding the PhD thesis of Pierre Casati.

9.2.5. ANR FOLD-DYN (November 2017 - October 2020)

Participant: Thomas Buffet.

The FOLDDyn project (Field-Oriented Layered Dynamics animating 3D characters) proposes the study of new theoretical approaches for the effective generation of virtual characters deformations, when they are animated. These deformations are twofolds: character skin deformations (skinning) and garment simulations. We propose to explore the possibilities offered by a novel theoretical way of addressing character deformations: the implicit skinning. This method jointly uses meshes (the standard representation for 3D animations) and volumetric scalar functions (an unusual representation in this community).

This 3-year contract is a joint project with the University of Toulouse.The contract started in November 2017 and is funding the PhD thesis of Thomas Buffet.

9.2.6. ANR ANATOMY2020 (November 2017 - October 2020)

Participants: Olivier Palombi, Rémi Ronfard, Vaishnavi Ameya Murukutla.

Anatomy2020 aims at developing an innovative educational platform to facilitate learning of functional anatomy. This platform will integrate recent advances in computer graphics, human-computer interaction together with recent insights in educational and cognitive sciences to design and test optimal scenarios for anatomy learning. The approach is based on evidences that body movements could improve learning of different knowledge by “augmenting” or “enriching” traces in long-term memory. This “embodied” perspective is particularly relevant for learning of functional anatomy as the knowledge to acquire could be specifically related to the learner's body in motion.

This 3-year contract is a joint project with TIMC (Computer-Assisted Medical Intervention team), Anatoscope, Gipsa-Lab (speech and cognition dept.), LIBM and LIG (Engineering Human-Computer Interaction team). The contract started in November 2017 and is funding the PhD thesis of Ameya Murukutla.

10. Dissemination

10.1. Promoting Scientific Activities

Rémi Ronfard is a member of the selection committee for Inria-MCC (Ministry of Culture and Communication) activities; and a member of the steering committee for the Eurographics workshop on intelligent cinematography and editing (WICED).

Stefanie Hahmann is a member of the Comité d'Etudes Doctorales (CED) at Inria Grenoble.

10.1.1. Scientific Events: Organisation

10.1.1.1. General Chair, Scientific Chair

Remi Ronfard and Julie Valéro (Litt & Arts, Univ. Grenoble Alpes) are chairing the first national meeting on computer theater (Journées d'Informatique Théâtrale), which will take place in Grenoble in February 2020.

Stefanie Hahmann was conference general co-chair for the ACM Symposium on Solid and Physical Modeling (SPM), Vancouver 2019.

10.1.1.2. Member of the Organizing Committees

Stefanie Hahmann was member of the organization committee of the SIAM Conference on Geometric Design, Vancouver 2019.

10.1.2. Scientific Events: Selection

10.1.2.1. Member of the Conference Program Committees

Mélina Skouras was a member of the Program Committees for ACM Siggraph Asia 2019 and Eurographics 2019.

Stefanie Hahmann was a member of the Program Committees for Symposium on Geometry Processing (SGP) 2019.

Rémi Ronfard was a member of the Program Committees for Motion, Interaction and Games (MIG) 2019, Intelligent Cinematography and Editing (WICED) 2019, and EXPRESSIVE 2019.

10.1.2.2. Reviewer

Rémi Ronfard was a reviewer for Siggraph 2019 and Siggraph Asia 2019.

10.1.3. Journal

10.1.3.1. Member of the Editorial Boards

Stefanie Hahmann is an Associate Editor of CAG (Computers & Graphics, Elsevier) and CAD (Computer Aided Design, Elsevier).

10.1.3.2. Reviewer - Reviewing Activities

Mélina Skouras was a reviewer for ACM Siggraph 2019, ACM Transactions on Graphics (TOG) and the International Journal for Numerical Methods in Engineering.

Stefanie Hahmann was a reviewer for Graphical Models (GMOD), Computers & Graphics (CAG) and Computer Aided Design (CAD).

Rémi Ronfard was a reviewer for ACM transactions on Graphics (TOG).

10.1.4. Invited Talks

Mélina Skouras gave an invited talk at the ACM/Eurographics Symposium on Computer Animation in July 2019.

Stefanie Hahmann gave an invited talk at the ARCADES workshop (Algebraic Representations in Computer-Aided Design for complEx Shapes) in Vienna, Austria, in November 2019.

10.1.5. Leadership within the Scientific Community

Remi Ronfard and Julie Valéro (Litt & Arts, Univ. Grenoble Alpes) are animating a research group on Digital Dramaturgies as part of the Performance Lab, IDEX Univ. Grenoble Alpes (2018-2021). This research group is actively investigating (i) how contemporary dramaturgies represent digital worlds on stage; (ii) how contemporary dramaturgies use digital tools for writing and staging performances combining real actors with virtual actors and scenographies; and (iii) how contemporary dramaturgies can be digitally captured, indexed and analyzed for a better comprehension of the creative processes at work during pre-production and rehearsals. The research group is composed of researchers of Univ. Grenoble Alpes from multiple disciplines, i.e. litterature, theatre, choreography, film studies, social sciences, geography, computer science and applied mathematics.

Stefanie Hahmann is the head of the French working group GTMG (Groupe de travail en Modélisation Géométrique) part of the CNRS GDR IM and GDR IGRV.

10.1.6. Scientific Expertise

Stefanie Hahmann was a member af the Advisory Board of the European ITN-ETN Marie-Curie Training Network ARCADES on Algebraic Representations for Computer-Aided Design of Complex Shapes from 2015 until 2019.

Stefanie Hahmann was a member of the selection committees for the SMA Young Investigator Award, Solid Modeling Association.

10.2. Teaching - Supervision - Juries

10.2.1. Teaching

Bachelor : Stefanie Hahmann, Numerical Methods, 42 HETD, 240 students, L3, Ensimag-Grenoble INP.

Master : Stefanie Hahmann, Geometric Modeling, 47 HETD, 60 students, M1, Ensimag-Grenoble INP.

Master : Stefanie Hahmann, Surface Modeling, 37 HETD, 30 students, M2, Ensimag-Grenoble INP.

Master: Mélina Skouras, Surface modeling, 14.5 HETD, M2, Ensimag, Grenoble, France

Master: Mélina Skouras, Numerical Mechanics, 8 HETD, M2, ENS de Lyon, France

Master: Rémi Ronfard teaches computer animation to MOSIG M2 students, 18 HETD, Grenoble INP, Univ. Grenoble Alpes.

PhD: Rémi Ronfard is an associate researcher in the Spatial Media team at ENSADLAB, where he teaches computer graphics to doctoral art students in the SACRE doctoral school, 60 HETD, Univ. Paris Sciences et Lettres (PSL).

Stefanie Hahmann is co-responsible of the department MMIS (Images and Applied Maths) at Grenoble INP with 120 students. Stefanie Hahmann was also president of the jury for over 20 Masters (PFE) thesis defences in 2019.

10.2.2. Supervision

PhD: Geoffrey Guingo, Synthesis of animated textures, supervised by Marie-Paule Cani, Jean-Michel Dischler and Basile Sauvage, was defended on December 3, 2019.

PhD: Amélie Fondevilla, Modélisation et animation de surfaces développables, supervised by Stefanie Hahmann and Damien Rohmer, was defended on Decembre 18, 2019.

PhD: Maxime Garcia, Animation transfer: character animation by playing and acting, since October 2016, supervised by Rémi Ronfard, was defended on December 19, 2019.

PhD in progress : Youna Le Vaou, Virtual Sculpture: shape creation and modification through immersive CAVE-like systems, since March 2017, supervised by Jean-Claude Léon and Stefanie Hahmann. Funded by CIFRE contract with PSA

PhD in progress : Ameya Murukutla, Storyboarding augmented reality anatomy lessons, since Octobre 2017, supervised by Rémi Ronfard and Olivier Palombi

PhD in progress : Pierre Casati, Modeling and animation of antique statues, since October 2017, supervised by Rémi Ronfard and Stéfanie Hahmann

PhD in progress : Qianqian Fu, Computational video editing of live performances, since November 2018, supervised by Rémi Ronfard and Benjamin Lecouteux (GETALP, LIG).

PhD in progress : Thomas Buffet, Efficient multi-layered cloth animation using implicit surfaces, since December 2017, supervised by Marie-Paule Cani and Damien Rohmer.

PhD in progress : Nachwa Aboubakr, Observation and modeling of human activities, since October 2016, supervised by James Crowley and Rémi Ronfard.

PhD in progress: David Jourdan, Design of free-from surfaces using self-actuated materials, since October 2018, supervised by Adrien Bousseau and Mélina Skouras.

PhD in progress: Mickaël Ly, Inverse elastic shell design with contact and friction with applications to garment design, since October 2017, supervised by Florence Descoubes and Mélina Skouras.

Master's thesis: Mélanie Carrière, 3D Design of Ancient Garments, June 2019, supervised by Mélina Skouras and Stefanie Hahmann.

Master's thesis: Shalu Dwivedi, Simulation of Laser-Cut Metamaterials, August 2019, supervised by Mélina Skouras.

Master thesis: Paul-Elian Tabarant, student at Telecom ParisTech, 3D sketching in virtual reality, July 2019, subervised by Stefanie Hahmann and Georges-Pierre Bonneau.

M1 Internship: Marion Taconné, Extensions to the aeroMorph Project, September 2019, supervised by Mélina Skouras.

M1 IRL: Manon Valle, Study of different norms for modeling inverse problems, May 2019, supervised by Mélina Skouras.

M1 IRL: Nathan Shourick, Existence of solutions to design inverse problems, May 2019, supervised by Mélina Skouras, Florence Bertails-Descoubes and Mickaël Ly.

10.2.3. Juries

Stefanie Hahmann was part of the jury CRCN 2019 at Inria Rennes, April 2019.

Stefanie Hahmann was member of the HDR committee a reviewer of the HDR Thesis of Alexandra Bac at Univ. Aix-Marseille.

Stefanie Hahmann also was a reviewer of 2 PhD theses, Université de Strasbourg (Cedric Bobenrieth) and Université de Bourgogne (Lucas Morlet) in 2019.

Stefanie Hahmann was an external reviewer of the PhD thesis of Alessandro Marro at University of Kaiserslautern, Germany.

11. Bibliography

Major publications by the team in recent years

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[9] M. LY, R. CASATI, F. BERTAILS-DESCOUBES, M. SKOURAS, L. BOISSIEUX. *Inverse Elastic Shell Design with Contact and Friction*, in "ACM Transactions on Graphics", November 2018, vol. 37, n^{o} 6, pp. 1-16 [*DOI :* 10.1145/3272127.3275036], https://hal.inria.fr/hal-01883655

[10] C. SCHRECK, D. ROHMER, S. HAHMANN, M.-P. CANI, S. JIN, C. C. WANG, J.-F. BLOCH. *Non-smooth developable geometry for interactively animating paper crumpling*, in "ACM Transactions on Graphics", December 2015, vol. 35, n^{o} 1, pp. 10:1-10:18 [*DOI :* 10.1145/2829948], https://hal.inria.fr/hal-01202571

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Doctoral Dissertations and Habilitation Theses

[11] A. FONDEVILLA. *Reverse-Engineering Fashion Products: From a single-view Sketch to a 3D Model*, UGA Grenoble France, December 2019

[12] M. GARCIA. *Performance transfer: animating virtual charaters by playing and acting*, UGA Grenoble France, December 2019

Articles in International Peer-Reviewed Journals

[13] T. BUFFET, D. ROHMER, L. BARTHE, L. BOISSIEUX, M.-P. CANI. *Implicit Untangling: A Robust Solution for Modeling Layered Clothing*, in "ACM Transactions on Graphics", July 2019, vol. 38, n^{o} 4, Article No. 120:1-12 [*DOI :* 10.1145/3306346.3323010], https://hal.archives-ouvertes.fr/hal-02129156

[14] G. CORDONNIER, B. BOVY, J. BRAUN. *A Versatile, Linear Complexity Algorithm for Flow Routing in Topographies with Depressions*, in "Earth Surface Dynamics", June 2019, vol. 7, n^{o} 2, pp. 549-562 [*DOI :* 10.5194/ESURF-2018-81], https://hal.archives-ouvertes.fr/hal-02136750

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