Pierre-Luc Manteaux

R&D Engineer

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Né le 13/11/1989 à Dijon

Professional experience

2012-2016 **Junior research scientist**, *INPG - University of Grenoble*.
Topic : Simulation and control of physical phenomena
Keywords : Adaptive simulation, topological changes, simulation control
Phenomena : Liquids and deformable objects
Numerical models : FEM, SPH, FLIP
Computer skills : C++, Python, OpenGL, CMake, Git, Jenkins

2015 **Junior research scientist** - **Visiting PhD student**, *IST Austria*, Austria.
3 weeks visit
Topic : International collaboration about the control of liquid animations
Keywords : Liquid simulation, control of animation
Result : Publication in an international conference [Man+16a]

2014 **Junior research scientist** - **Visiting PhD student**, *University of california, Berkeley*, USA.
3 months visit
Topic: International collaboration about the interactive cutting of deformable objects
Keywords : Topological changes, interactive application
Result : Publication in an international conference [Man+15]

2015–2016 **Grad student teaching position at ENSIMAG**, *Grenoble*.
Teaching hours : 16.5h
Topic : Basics of computer graphics
Content : Procedural and physics-based animation, procedural and descriptive modeling, local illumination

2012–2016 **Grad student teaching position at ENSIMAG, l'UFR-IMAG et Polytech Grenoble**.
Teaching hours : 55.5h
Content : Scientific visualisation, numerical geometry, image synthesis

2012 **Research assistant at Laboratoire Jean Kuntzmann**, *Grenoble*.
6 months internship
Topic : Stochastic optimization for data assimilation
Keywords : Adjoint method, particle swarm optimization

2011 **Research and development engineer at MANN+HUMMEL**, *Laval*.
3 months internship
Topic : Optimal task scheduling
Keywords: Branch and bound algorithm

Diploma

2012–2016 **Doctor of philosophy (PhD), Computer Graphics**, *INPG, Laboratoire Jean Kuntzmann*.
Topic : *Simulation and control of physical phenomena*
Advisors : François Faure et Marie-Paule Cani
Fund: ERC

2010–2012 **Engineer's degree in mathemathics and computer science** - ENSIMAG, *Grenoble*.
Option : Modeling, computing, simulation

2007–2010 **Bachelor's degree in sciences and techniques** - Université de Bourgogne, *Dijon*.
Option : Mathematics, High honors

Research

Research projects

PhD topic.

In computer graphics, the physical phenomena simulated for the creation of animations, video games or the design of objects are more and more complex: First, in terms of the computational cost, the scale of the simulations can be extremely important; Then, in terms of the complexity of the phenomena themselves, which require the models to be able to change their state and shape. This growing complexity introduces new challenges in order to offer control on these large scale simulations to the user. In many cases, this control is reduced to a trial-and-error process in order to determine the parameters of the simulation which best meet the objectives of the user. I focused my thesis on these challenges through several research projects.

Adaptive particles simulations.

We extend an adaptive model used in molecular dynamics to computer graphics applications. In contrast with common adaptive schemes, the memory cost is constant and the integration in existing framework is particularly easy. First, we propose an algorithm which combines this adaptive model with SPH liquid simulations. Then, we introduce an implicit solver that allows the use of the adaptive model for the simulation of deformable objects. These results were published at VRIPHYS 2013 [Man+13].

Advanced study of adaptive physically-based models for computer graphics.

I coordinated a team of 5 researchers for the study of adaptive physically-based models for computer graphics. This work was published as a state of the art report in the journal *Computer Graphis Forum* [Man+16b].

Detailed cutting of thin deformable objects.

We propose a new method that allows the detailed cutting of thin deformable objects while using a very few number of degrees of freedom. We leverage the frame-based simulation method and dynamically update the shape functions so that they take into account the changing topology of the object during the cutting process. This update is made by using a new structure that we named non-manifold grid. This work was published in *Motion In Games* 2015 [Man+15].

Edition d'animations complexes de liquides.

Most of the time, the design of a liquid animation is long and tedious trial-and-error process. We propose a system to edit the animation resulting from a simulation. Inspired by 3D sculpting paradigms, we propose new tools to edit the animation and take into account the temporal aspect of the animation. Visually interesting regions of the animation can be selected and edited. This work was published in *Motion In Games* 2016 [Man+16a].

Teaching

Enumeration of the main courses

Course	H	Type	Leve	Nb	Year
3D Graphics	34.5	TP	Bac+4	30	14, 16
Image project	60	P	Bac+4	4	13-16
Image synthesis	12	TP	Bac+4	30	14
Scientific visualization	9	TP	Bac+5	30	14
Numerical geometry	16.5	TP	Bac+4	30	14

Caption
H: Number of hours taught in the course.
Type: Type of course, Practicals(TP), Project (P)
Level: Post-bac level of the students
Nb: Average number of students in the course
Year: The years I handled the course

Main personal contribution

In the context of the course of 3D Graphics at ENSIMAG, I proposed and achieved a complete update of the practicals allowing the use of modern capabilities of the graphics cards. I also created a web version of the practicals which allows a smooth introduction to the different topics of the course by using a tutorial model, much more easily and quickly understandable for the student. The up-to-date version of the practicals propose an introduction to OpenGL4 and to the main topics of computer graphics : rendering, modeling and animation.

Specific courses

I involved myself in the management of small groups of students (4 students) during the *special project at ENSIMAG*. Thus, I had the chance to start advanced scientific projects about different topics :

- ○ Modeling and animation of the shape transformation of a blood platelet
- ○ Ecosystem generation
- ○ Fluid simulation in porous media
- ○ Animation of paper tearing with sound
- ○ SPH particle-based liquid simulation
- ○ Shallow-water equations simulation using SPH

Personal projects

Aside my PhD, I initiated and participated to several projects.

SPH Library.
A C++ library that implements the implicit incompressible SPH model proposed by Ihmsen et al. for the simulation of liquids.

Video editing.
I frequently used the Adobe Premiere software to edit scientific videos and short movies(Dessins de môme).

Reading group.
Inside my research team, I organized and animated reading sessions of scientific articles.

Science fest event.
I participated to the INRIA booth for the Fête de la science event which aimed at initiating high-school students to rendering and image synthesis.

Computer skills

Types	Expert	Mid-level
Langues	C++11 (Qt, Eigen, CGAL, SOFA)	OpenGL 4.5, Python, Java, Shell
Version control	GIT	SVN
Office software	LaTeX	Office

Languages

French **Mother tongue**

English **Read, spoken, written** (TOEIC score: 830/990)

List of publications

Publications in international journals.

[Man+16b] P.-L. Manteaux, C. Wojtan, R. Narain, S. Redon, F. Faure, and M.-P. Cani.
"Adaptive Physically Based Models in Computer Graphics".
Computer Graphics Forum (2016).

Publications in international conference with peer-reviewing.

[Man+16a] Pierre-Luc Manteaux, Ulysse Vimont, Chris Wojtan, Damien Rohmer, and Marie-Paule Cani.
"Space-time sculpting of liquid animation".
Motion In Games.
2016.

[Lej+15] Thibault Lejemble, Amélie Fondevilla, Nicolas Durin, Thibault Blanc-Beyne, Camille Schreck,
Pierre-Luc Manteaux, Paul G. Kry, and Marie-Paule Cani.
"Interactive Procedural Simulation of Paper Tearing with Sound".
Proceedings of the 8th ACM SIGGRAPH Conference on Motion in Games.
2015.

[Man+15] Pierre-Luc Manteaux, Wei-Lun Sun, François Faure, Marie-Paule Cani, and James F. O'Brien.
"Interactive Detailed Cutting of Thin Sheets".

Proceedings of the 8th ACM SIGGRAPH Conference on Motion in Games.
2015.

[Man+13]   Pierre-Luc Manteaux, François Faure, Stephane Redon, and Marie-Paule Cani.
"Exploring the Use of Adaptively Restrained Particles for Graphics Simulations".
VRIPHYS 2013 - 10th Workshop on Virtual Reality Interaction and Physical Simulation.
2013.