Julien Diener

Curriculum Vitae

Education

2005–2008 **Doctorat en Mathématique Informatique**, *Institut Polytechnique de Grenoble*.
Excellent à exceptionnel

2004–2005 **Master 2 Image Vision Robotique**, *Institut Polytechnique de Grenoble*, Grenoble.
Bien

2000–2004 **B.Sc in Math with Computer Science**, *Heriot-Watt University*, Edinburgh.
First Class with Honours

Experience

Oct-2014 **Reasearch Engineer**, ZENITH, INRIA, Montpellier.
June-2015 Data integration, cloud and web services developper in the Xdata and Sifr project.

Sept-2011 **Postdoc**, VIRTUAL PLANT, INRIA, Montpellier.
Oct-2014 Image and graph analysis of root system architecture. I worked primarily on the RhizoScan project and also participated to the development of the RSML file format.

Sept-2010 **Teaching assistant (ATER)**, UNIVERSITÉ DE NICE SOPHIA-ANTIPOLIS, Nice.
August-2011 Video and spectral analysis in a project studying ciliary beating of Paramecium cells.
Teachings :
- class and tutorial on Algorithmic to first year MASS student, in Java
- tutorial of Operating System
- tutorial of Unix system
- tutorial of Functional Programming in Scheme
- tutorial of Introduction to computer science

Jan-2009 **Postdoc**, LADHYX, ECOLE POLYTÉCHNIQUE, Paris.
March-2010 Development of a toolbox for spectral analysis of plant motion from video.

Sept-2005 **Ph.D.**, *at* EVASION, INRIA, Grenoble.
Dec-2008 Methods to generate the motion of virtual plants. Two main approaches have been explored :
- Acquisition and reproduction of real motion from videos
- Real-time simulation of the tree response to wind load

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Projects

2014–2015 **XData**.

The XData project is a french collaborative project between industrials, startups as well as big companies, and academics. Its main objective is to develop innovative commercial product constructed from the integration of private data with open data.
I mostly work on :

1. The data integration of the *movement* data : any type of data that represent people displacement such as housing or companies moving, as well as tourist displacement. The integration is done in two main parts : first a generalized data structure has been defined using a generic data descriptor to allow importing any data set containing movement data ; second an automated data query algorithm has been developped to select suitable movement entries with respect to geographical and temporal area, and their granularity (i.e. precision).
2. The transfer of the stand alone prototype of the web application, which use mysql and spring technologies, on the hadoop cluster of the xdata project, in particular using spark and hive.

2014–2015 **Sifr**.

The SIFR project investigates the scientific and technical challenges in building ontology-based services to leverage biomedical ontologies. My work consists to :

1. Provide a unique access point to several servers running the ontology annotators developed by the NCBO, such as their bioportal.bioontology.org/annotator.
2. Wrap new functionalities around these annotators. In particular, I worked on adding RDF output format and the annotation scoring methods which have been published in Scoring semantic annotations returned by the NCBO Annotator.
3. Update the initial (GWT web application) WebSmatch to include those functionalities.

2013 **RSML**.

With several of the main actors in root system measurement and analysis, we have developed the RSML file format. It allows to store 2D or 3D image metadata, plant and root properties and geometries, continuous functions along individual root paths and a suite of annotations at the image, plant or root scales, at one or several time points.

G. Lobet, M. P. Pound, J. Diener, C. Pradal, X. Draye, C. Godin, M. Javaux, D. Leitner, F. Meunier, P. Nacry, T. P Pridmore, A. Schnepf, *Root System Markup Language: toward a unified root architecture description language*, Plant Physiology.

2011–2014 **Rhizoscan**.

I developed image and graph analysis technologies to automatically process large number of images of root systems and extract their architecture. The algorithms and full processing pipeline are implemented in the RhizoScan python package which can be integrated in the OpenAlea modeling framework.

Poster at the 7th internation conference on Functional-Structural Plant Model
Poster at the CSHL meeting: Automated Imaging and High Throughput Phenotyping

2010–2011 **Measurement of paramecium ciliary beating from video** .

Paramecium cells swim and feed by beating their thousands of cilia in coordinated patterns. My work was to develop a video processing algorithm and user interfaces to 1) track the paramecium cells, 2) extract the ciliary area around the cells from the video as normalized video sequences in order to decouple the cell movement from the motion of the cilia, and 3) provide tools and methodology to apply spectral analysis on the generated video signal.

A. Funfak, C. Fisch, H. T. A. Motaal, J. Diener, L. Combettes, C. N. Baroud and P. Dupuis-William, *Paramecium swimming and ciliary beating patterns: a study on four RNA interference mutations*, Integrative Biology vol. 7, 2015

2009–2010 **Spectral analysis of plant motion from video**.

The goal of my research is to develop a method and practical tools to study plant dynamics and structure using video data. Through this project, I have coded the matlab CR-toolbox containing a set of algorithms that allows to compute the motion fields from video sequences and running spectral analysis on the extracted motion data. This toolbox proposes a user friendly interface designed to be used by scientists who are not specialized in image processing.

BARBACCI, A., DIENER, J., HÉMON, P., ADAM, B., DONÈS, N., REVERET, L., MOULIA, B., *A robust videogrametric method for the velocimetry of wind-induced motion in trees*. Agricultural and Forest Meteorology 184 :.220 - 229

2007–2008 **Real-time simulation of the tree response to wind load**.

We developed a real-time method to animate complex scenes of thousands of trees under a user-controllable wind load.
Firstly, modal analysis is applied to extract the main modes of deformation from the mechanical model of a 3D tree. The novelty of our work is to precompute a linear basis for the modal stress of the tree under wind load. At runtime, this basis allows to replace the modal projection of the external forces by a direct mapping for any directional wind. We provided an efficient implementation of our method on graphics hardware. This modal animation can be simulated at low computation cost even for large scenes containing thousands of trees.

Diener, J., Rodriguez, M., Baboud, L., Reveret, L., *Wind Projection Basis for Real-Time Animation of Trees*, Computer Graphics Forum (Proceedings of Eurographics 2009)

2005–2006 **Acquisition and reproduction of real motion from videos**.

We worked on an algorithm to extract from a single video sequence, motion fields of real plants under the influence of wind, and to transfer this motion on complex synthetic 3D plant models. The extracted motion is retargeted without requiring physical simulation.
First, feature tracking is applied to the video footage, allowing the 2D position and velocity of automatically identified features to be analysed. A key contribution of our work to use statistical clustering to extract a hierarchical geometric structure, identified as branches, that terminates according to the cut-off threshold of the classification algorithm. Another contribution is to use this hierarchical structure as a motion controller to animate any complex 3D model of similar, but non-identical, plants using a standard skinning algorithm. Our work is the first motion capture methods for plants, where a single video source serves as input device for a large class of virtual plants.

Diener, J., Reveret, L., Fiume, E. *Hierarchical retargetting of 2D motion fields to the animation of 3D plant models*, 2006 ACM SIGGRAPH/Eurographics Symposium on Computer Animation, SCA'06,, Vienna, Austria, September 2006.

Skills

Computer language	**Python, Java, Matlab, C++**, scala, javascript, php **json, xml**, RBF
Framework and techno	**Numeric Python** (numpy, scipy, scikit-learn, scikit-image), **Hadoop, Spark, Spring, Maven**
Scientific methods	**Image and video analysis, Numerical statistics and machine learning,** **Graph analysis, Spectral methods**, Finite Element Method
OS	**Linux, Mac**, Windows
Human language	**French** Mothertongue **English** Proficient in spoken and written english **German** Notion

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