



Multi-channel procedural models for modelling virtual worlds

Proposal for a PhD in Computer Science at the University of Strasbourg, France.

Modèles procéduraux multi-canaux pour la modélisation de mondes virtuels

Proposition de thèse de doctorat en informatique à l'Université de Strasbourg.

Authoring huge virtual scenes with a high level of detail is a perennial challenge in the digital entertainment industry. The difficulty stems not only from a user-demanding and time consuming hand-modeling process, but also from the huge amount of data that needs to be generated, stored and/or transferred, and eventually rendered.

Procedural models have demonstrated to be efficient and compact generating tools that allow for the creation of huge scenes in real time. Textures [Gilet et al. 2014] as well terrain or city geometry [Guérin et al. 2016] can be generated with this approach. Most existing models consider single-channel data (such as gray-scale textures or terrain elevation). Multi-channel synthesis has not received much attention; moreover when several channels are taken into account, the interactions between channels remains limited to simple rules. However, realistic scenes may exhibit complex interactions between different types of data, each data being represented by one or several channels. A landscape, for example, may require the modeling of terrain elevation, vegetation type and density, colors, and interactions between each-other.

In this project, we will focus on procedural multi-channel models based on sparse convolution of impulses with a dictionary. First, we will elaborate models that analyse and reproduce the correlations between the different channels so as to simulate and imitate the complex interactions as faithfully as possible. Second, we will propose algorithms to instantiate our procedural models, either by converting an example data set, or by high-level intuitive modeling tools. It consists in defining a sparse dictionary together with statistical rules for both the variations within the dictionary and the interaction between the channels.

Related papers

[Gilet et al. 2014] Local random-phase noise for procedural texturing,
G. Gilet , B. Sauvage, K. Vanhoey, J-M. Dischler, D. Ghazanfarpour.
ACM Transactions on Graphics (proc. Siggraph Asia), 33(6), 2014.

[Gu erin et al. 2016] Sparse representation of terrains for procedural modeling
Eric Gu erin, Julie Digne, Eric Galin, Adrien Peytavie
Computer Graphics Forum. Volume 35, number 2. Proceedings of Eurographics 2016, Lisbon.

Location

The candidate will be hosted at the University of Strasbourg, in the Computer Graphics team of the ICube lab. He/she will be co-advised by Jean-Michel Dischler and Basile Sauvage. He/she will collaborate with Eric Gu erin in the context of HDWorlds project.

Links

- Team at the ICube lab http://icube-igg.unistra.fr/en/index.php/Main_Page
- HDWorlds project <http://hdworlds.unistra.fr>
- Jean-Michel Dischler http://icube-igg.unistra.fr/fr/index.php/Jean-Michel_Dischler
- Basile Sauvage http://icube-igg.unistra.fr/fr/index.php/Basile_Sauvage
- Eric Gu erin (<http://liris.cnrs.fr/eric.guerin/>)

Funding

ANR project HDWorlds.

Who should apply

- Master degree in Computer Science, or equivalent.
- Strong background in computer graphics, mathematics, and programming.
- Fluent french or english speaking.

How to apply

Send a CV and an application letter before July 14th
to sauvage@unistra.fr, dischler@unistra.fr, eric.guerin@liris.cnrs.fr.