Marie-Paule Cani's Visit

Schedule - November 23rd, 2016

[10:15 → 11:45] Masterclass (room 26-00/101)

Short scientific presentations by PhD students and post-docs. Each presentation (15 minutes) is followed by an open discussion with Marie-Paule Cani (15 minutes):

- Chiara Nardoni (Institut des Sciences du Calcul et des Données, Ph.D. student, UPMC)

  Title : An optimization method for elastic shape matching. Applications to forensic facial reconstruction.

  Abstract : Shape morphing or matching arises in a wide variety of situations in areas from biomedical engineering to computer graphics and scientific computing. Beyond the specific stakes to each particular application, the general issue is to find one transformation from a given 'template' shape Ω_0 into a 'target' Ω_T. Such a transformation may be used as a means to appraise how much Ω_0 and Ω_T differ from one another - for instance in shape retrieval, classification or recognition - or to achieve physically the transformation from Ω_0 to Ω_T (in shape registration, reconstruction, or shape simplification).

  Our problem is stated as follows : given a 'template' shape Ω_0, numerically described by means of a computational mesh, and a 'target' shape Ω_T, known only via a signed distance function to its boundary, we aim at deforming iteratively the mesh of the template shape into a computational mesh of the target shape. To achieve this goal, we rely on techniques from shape optimization. Under the sole assumption that both shapes share the same topology, the desired transformation is realized as a sequence of elastic displacements, which are obtained by minimizing an energy functional based on the distance between the two shapes. In doing so, it is expected that the deformation will be easier to achieve in numerical practice, and in particular by limiting the troubles due to mesh tangling.

  The proposed method has been used to address the facial reconstruction problem: we aim at virtually reconstructing a face starting from the sole datum of the underlying raw skull. To achieve this goal, we rely on an original combination of mesh deformation techniques. Some preliminary results are presented to show the efficiency of the method.

  Related publication : An optimization method for elastic shape matching, M. de Buhan, C. Dapogny, P. Frey, C. Nardoni, C.R. Acd. Sci., Paris, Srie I, 2016. Link to the paper

- Noura Faraj (MAP5, Post-doc, Paris Descartes)

  Title : Multi-Material Adaptive Volume Remesher

  Abstract : We propose a practical iterative remeshing algorithm for multi-material tetrahedral meshes which is solely based on simple local topological operations, such as edge collapse, flip, split and vertex smoothing. To do so, we exploit an intermediate implicit feature complex which reconstructs piecewise smooth multi-material boundaries made of surface patches, feature edges and corner vertices. Futhermore, we design specific feature-aware local remeshing rules which, combined with a moving least square projection, result in high quality isotropic meshes representing the input mesh at a user defined resolution while preserving important features. Our algorithm uses only topology-aware local operations, which allows to process difficult input meshes such as self-intersecting ones. We evaluate our approach on a collection of examples and experimentally show that it is fast and scales well.

  Related publication : Multi-Material Adaptive Volume Remesher, N. Faraj, J.-M. Thiery, T. Boubekeur, Computer and Graphics (proc. Shape Modeling International 2016). Link to the paper

- Norbert Bus (LTCI, Post-doc, Telecom ParisTech)

  Title : A hierarchical data structure for efficient clustering in the many-lights methods and its further use

  Abstract : Instant radiosity methods (also known as many-lights methods) have been successfully used for both real-time and high quality off-line rendering. They approximate global illumination by computing the direct illumination of a set of virtual point lights (VPLs). In high quality off-line rendering a vast number of VPLs are needed to approximate an image faithfully thus several methods have been proposed to cluster these VPLs to reduce computation time. This talk presents a method to further improve the efficiency of these rendering algorithms by extending the space of clustered objects from VPLs to the product space of shaded points and VPLs. The proposed data structure leads to a compact representation of the light field enabling its usage in Monte-Carlo algorithms as well.

  Related publication : Illumination Cut, N. Bus, N. Mustafa, V. Biri, Computer Graphics Forum (Proc. of Eurographics 2015). Link to the paper

[12:00 → 13:45] Lunch

Lunch at the restaurant "Les Sciences" with:

- Pascal Frey, Institut des Sciences du Calcul et des Données;
- Matthieu Cord, LIP6;
- Julien Tierny, LIP6.

[14:00 → 16:00] Visit of the campus

Visit of the campus including short meetings with researchers of different teams:

14:00 → 15:00 Visit of the Institut des Sciences du Calcul et des Données with Pascal Frey (room 33-34/204);

15:00 → 16:00 Presentation of the scientific visualization activities at the LIP6 laboratory with Julien Tierny (room 26-00/334).

[16:00] End of the visit