An optimization method for elastic shape matching

Chiara NARDONI, Institut du calcul et de la simulation (ICS),UPMC Univ Paris 06

Maya DE BUHAN, MAP5, CNRS UMR 8145,Université Paris Descartes

Charles DAPOGNY, Laboratoire Jean Kuntzmann, CNRS, Université Joseph Fourier, Grenoble

Pascal FREY, Institut du calcul et de la simulation (ICS),UPMC Univ Paris 06

This poster addresses the following shape matching problem: 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 (see for instance [1],[4],[6],[7],[8]).
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. See e.g. [2] for an example of use of elastic displacements in the context of mesh displacement. The proposed method has been implemented in a finite elements setting and numerical examples in two and three dimensions are presented to illustrate its efficiency.
The proposed method 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). See for instance [9] and references therein for an overview of several related applications.

Références

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Chiara NARDONI, Sorbonne Universités, UPMC Univ Paris 06, Institut du calcul et de la simulation (ICS), F-75005, Paris, France
chiara.nardoni@upmc.fr