

# An optimization method for elastic shape matching

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This poster addresses the following shape matching problem: given a ‘template’ shape  $\Omega_0$ , numerically described by means of a computational mesh, and a ‘target’ shape  $\Omega_T$ , 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  $\Omega_0$  and  $\Omega_T$  differ from one another - for instance in shape retrieval, classification or recognition - or to achieve physically the transformation from  $\Omega_0$  to  $\Omega_T$  (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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