Geometric constraints for shape and topology optimization in architectural design

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: The aim of this work is to propose a shape and topology optimization framework for conceptual architectural design,
with a particular emphasis on the possibility for the user to interfere on the optimization process by supplying information about his personal taste.
More precisely, we formulate three novel constraints on the geometry of shapes; while the first two are mainly related to aesthetics, the third one may also be used to handle several fabrication issues that are of special interest in the device of civil structures.
The common mathematical ingredient to all three models is the signed distance function to a domain,
and its sensitivity analysis with respect to perturbations of this domain; in the present work, this material is extended to the
case where the ambient space is equipped with an anisotropic metric tensor.
Numerical examples are discussed in two and three space dimensions. This is a joint work with A. Faure (SiMap), G. Michailidis (SiMap), G. Allaire (CMAP), A. Couvelas (SHAPE IKE) and R. Estevez (SiMap).