Shape and Topology Optimization Using A Hybrid Geometry Approach

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ABSTRACT

We develop a shape and topology optimization approach which builds on a so called hybrid geometry representation. The hybrid geometry representation represents certain parts of the geometry using a parametric isogeometric approach and the remaining parts are represented using a level set description. The hybrid geometry representation offers a flexible approach to geometry representation which we combine with CutIGA or CutFEM, see [1] and [4] for an on introduction to these techniques, to construct a finite element discretization of the partial differential equations we wish to solve. Applications of this approach include: (1) Partial parametric meshing of complicated geometries, where we use a parametric tensor product approach for the well defined structured parts of the geometry and levelset for the parts where the geometry is more unstructured. (2) Shape and topology optimization for problems where certain parts of the geometry is given. In this case it is common that the given parts has a lot of structure since these parts often provide main functionality or contact surfaces with other parts. (3) Shape and topology optimization were we first compute a rough concept design using levelset evolution and then replace certain parts with parametric objects and perform parametric optimization. See [2] and [3] for details on levelset based shape and topology optimization based on CutFEM.

REFERENCES

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