Reducing overhangs in additive manufacturing by the deployment of Shape and Topology Optimization

Maximilian Urmann

27.06.2024

Additive manufactuing techniques like 3D-printing are able to produce complex structures and topologies. To guarantee constructability, overhangs need either support structures or should be avoided in total. To reduce the criticality of overhangs, we study a shape and topology opitimization problem in a phase field setting, which leads to the design of rigid structures that can be constructed with additive manufacturing techniques.

To solve this problem numerically, the VMPT (Variable Metric Projection Type) method is presented and applied. Finally, we perform numerical experiments on multiple examples in which the impact of model parameters on the shape and topology is presented. Furthermore, the benefits of the deployment of the VMPT methods will be discussed.