Maximum length scale in density based topology optimization

The focus of this work is on two new techniques for imposing maximum length scale in topology optimization. Restrictions on the maximum length scale provide designers with full control over the optimized structure and open possibilities to tailor the optimized design for broader range of manufacturing processes by fulfilling the associated technological constraints. One of the proposed methods is based on combination of several filters and builds on top of the classical density filtering which can be viewed as a low pass filter applied to the design parametrization. The main idea is to construct band pass filter which restricts the appearance of very thin and very thick elements in the design. In combination with the robust design optimization formulation the methodology results in manufacturable designs without the need of any post processing. The second technique provides more strict control on the maximum design features and is developed with the help of morphological operators. The formulation relies on a small number of additional constraints. Both approaches are demonstrated on optimization problems in linear elasticity.