Karlsruhe Institute of Technology

Seminar im Rahmen des GRK 2078

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Titel: **Topology optimization for injection molding of short fiber reinforced plastics**

Abstract

Today there exists a huge demand for technologies which enable and facilitate the mass production of fiber reinforced composites. Injection molding of Short Fiber Reinforced Plastics (SFRP) is a quite popular method especially in the automotive industry, providing high stiffness levels on the one hand and complex moldable shapes on the other hand. Due to the high cost of mold production and injection molding machines, nowadays lots of research is done to improve models and to develop software for the simulation of this process. This allows to detect problems with the mold design and optimization of the part performance and quality at an early stage of the development. In the case of SFRP injection molding, the mechanical properties of the finished part are mainly influenced by the local fiber orientation, which itself depends on the shape/topology of the part. We investigate an approximate approach for compliance-based topology optimization of short fiber-reinforced plastic (SFRP) parts. The approximation consists in the replacement of the costly filling and fiber orientation simulation by the solution of an Eikonal equation [1] and later by the solution of a Poisson equation. The problem is then discretized using the Finite Element Method and the optimization problem is solved using the classical SIMP method [2, 3] in combination with a transversely isotropic material law and a projected gradient method. Further we compare the SIMP approach to the recently developed topology optimization algorithm based on the canonical duality theory [4, 5].

References

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[4] David Yang Gao. Canonical duality theory for topology optimization. ArXiv e-prints, December 2016.
[5] David Yang Gao and Elaf Jaafar Ali. A novel canonical duality theory for solving 3-d topology optimization problems. *ArXiv e-prints*, March 2018.

Alle Interessenten sind herzlich eingeladen.
Prof. Dr.-Ing. Thomas Böhlke