



Technion-Israel Institute of Technology
Computer Science Department
Center for Graphics and Geometric Computing



CGGC Seminar

Sebastian Eusterholz

RWTH Aachen University

A NURBS-based multi-stage approach for shape optimization of mixing elements in single-screw extruder

Today, extrusion is one of the most important techniques for manufacturing continuous polymer profiles. Despite their widespread use, extruded products initially often suffer from both poor shape quality and material inhomogeneities due to inadequate process design. In an industrial environment, the elements of the extrusion line are therefore subject to extensive running-in trials. During these trials, both geometry and process conditions are iteratively adapted until the product attains the required quality. It is the aim of our work to largely replace these financially demanding and time-consuming trial runs by numerical simulations. Based on a method already used in die design, we develop concepts for the method's extension towards the numerical design of mixing-elements in single-screw extruders.

Our setup consists of four fundamental steps: (1) definition of a suitable objective function, (2) flexible NURBS-based parameterization of the geometry, (3) flow simulation, and (4) geometry modification based on an optimization algorithm. We conduct non-isothermal flow simulations modeling the melt as an incompressible shear-thinning fluid. To reduce the modelling error we use boundary-conforming grids.

The novelty in our method is to determine a suitable geometry that provides sufficient mixing by reformulating the mixing problem into a shape-optimization problem. We discuss the inherent challenges of a) the given shape-optimization problem, and b) its solution in black-box fashion. Special focus is put on suitable geometry parameterizations reflecting the assumed limitation on the number of optimization parameters. A multi-stage NURBS-based approach is presented to solve this issue.

This abstract is a little more generic than what you asked, but I hope this way I can contextualize a little more what we are doing. The main focus I will put on the NURBS-based nature of the approach though, since this is the direct connection to IRIT.

The lecture will be held on Wednesday, 05.12.2018, at 13:30, Taub 401

הזמנה זו מהווה אישור כניסה עם רכב לטכניון