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Efficient Computation of Global Resolvent Modes

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Abstract

In this paper we propose a completely unique approach to unravel the inverse problem of three-dimensional die design for extrudate swell, employing a real-time active control scheme. To the present end, we envisioned a feedback connection between the corner-line finite element method, wont to predict the positions of the free surfaces of the extrudate, and therefore the controller. The corner-line method allows for local mesh refinement and transient flow to be taken under consideration (Spanjaards et al., 2019). We show the validity of this method by showing optimization results for 2D axisymmetric extrusion flows of a viscoelastic fluid for various Weissenberg numbers. In 3D we first provides a proof of concept by showing the results of a Newtonian fluid exiting dies with increasing complexity in shape. Finally, we show that this method is in a position to get the specified extrudate shape of extrudates of a viscoelastic fluid for various Weissenberg numbers and different amounts of shear-thinning.Extrusion may be a common production technique within the polymer processing industry to get products with a desired cross-section. during this process a polymer is molten and pushed through a die with a particular cross-sectional shape, to get a product (extrudate) with this same cross-sectional shape. A standard requirement on the extrudate is dimensional precision. However, the size of the extrudate are highly influenced by a phenomenon called extrudate swell, where the extrudate starts to expand thanks to internal stresses within the polymer once it leaves the die.

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