

國立中山大學應用數學系

學術演講

講者：李雪甄 教授
文藻外語大學

講題：Study on the viscoelastic fluid flows through one slot channel using least-squares finite element methods

時間：2018/04/26（星期四）15:30 ~ 16:30

地點：理學院四樓理 SC 4009-1 室

茶會：15:00 於理 SC 4010 室（系辦公室）

摘要

This work presents a least-squares (LS) finite element method for analyzing linear Phan-Thien-Tanner (PTT) viscoelastic fluid flows through a slot channel. We consider stabilized weights in the LS method for the viscoelastic model and prove that the LS approximation converges to the linearized solutions of the linear PTT model at the optimal rate, and we use the flow through a planar channel to illustrate our theoretical results. We extend the LS method to a slot channel problem and discuss the physical parameter effects. Numerical solutions of the flow through the slot channel with the two depth ratios indicate that the viscoelastic polymer solution flow characteristics are described by the results obtained using the method. Furthermore, we present the hole pressure for various Weissenberg numbers, and compare with that derived from the Higashitani-Pritchard (HP) theory. The results show that the HP equation is valid for viscoelastic fluid flows with a low Weissenberg number and that the streamlines used in this approach for the flow over a slot agree with published results. Finally, we also present efficient solutions using an adaptive LS method based on the maximum shear stress for viscoelastic transverse slot problems.

Reference

1. Hsueh-Chen Lee, Hyesuk Lee (2018), Numerical simulations of viscoelastic fluid flows past a transverse slot using least-squares finite element method, submitted.
2. Hsueh-Chen Lee (2018, Jan), Adaptive weights for mass conservation in a least-squares finite element method, International Journal of Computer Mathematics, 95, No. 1, 20-35.
3. Hsueh-Chen Lee (2017, July), Numerical simulations of viscoelastic fluid flows using a least-squares finite element method based on Von Mises stress criteria. International Journal of Applied Physics and Mathematics, 7(3),157-164.

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