LOCAL NULL CONTROLLABILITY OF A CLASS OF NON-NEWTONIAN INCOMPRESSIBLE VISCOUS FLUIDS

YURI THAMSTEN

Abstract. We investigate the null controllability property of systems that mathematically describe the dynamics of some non-Newtonian incompressible viscous flows. The principal model we study was proposed by O. A. Ladyzhenskaya, although the techniques we develop here apply to other fluids having a shear dependent (or gradient dependent) viscosity. Taking advantage of the Pontryagin Minimum Principle, we utilize a bootstrapping argument to prove that regular controls to the forced linearized Stokes problem exist, as long as the initial data in turn has enough regularity. From there, we extend the result to the nonlinear problem. As a byproduct, we devise a quasi-Newton algorithm to compute the states and a control, which we prove to converge in an appropriate sense. We finish the work with some numerical experiments. This is a joint work with P. de Carvalho, J. Límaco and D. Menezes.

Instituto de Matemática e Estatística, Universidade Federal Fluminense
Email address: ythamsten@id.uff.br

Date: September 23, 2020.