Exact Controllability of the N-dimensional Navier-Stokes equations with N-1 scalar controls

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In this talk, we deal with the incompressible Navier-Stokes equations in dimension 2 or 3 with homogeneous Dirichlet boundary conditions on a bounded and regular domaine Ω. We consider the associated control problem where the control function acts through the right-hand side over a small open set $\omega \subset\subset \Omega$. For this system, the *local exact controllability to the trajectories* with N scalar controls is very well-known (see, for instance, [1] or [2]).

In the more recent paper [3], the authors used the results in [2] to establish the local exact controllability to the trajectories of the same system with $N-1$ scalar controls provided that the control domain ω 'touches' the boundary $\partial\Omega$. The objective of this talk is to prove that this last condition is not necessary.

The idea of the proof is as follows: first, we establish the null controllability of a linearized system associated to the Navier-Stokes equations with $N-1$ scalar controls. Then, we use a fixed-point argument.

[1] O. Yu. Imanuvilov, *Remarks on exact controllability for the Navier-Stokes equations*, ESAIM Control Optim. Calc. Var., **6** (2001), 39–72.

[2] E. Fernández-Cara, S. Guerrero, O. Yu. Imanuvilov and J.-P. Puel, *Local exact controllability of the Navier-Stokes system*, J. Math. Pures Appl. Vol 83/12, pp 1501-1542.

[3] E. Fernández-Cara, S. Guerrero, O. Yu. Imanuvilov and J.-P. Puel, *Some controllability results for the N-dimensional Navier-Stokes and Boussinesq systems with $N-1$ scalar controls*, SIAM J. Control Optim. 45 (2006), no. 1, 146–173.

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