

# **Optimal boundary control for the steady Navier-Stokes equations with directional do-nothing boundary conditions**

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We consider the steady Navier–Stokes equations with mixed boundary conditions, where, instead of the classical do-nothing (CDN) outflow condition, a directional do-nothing (DDN) or a regularized directional do-nothing (RDDN) condition are imposed. An auxiliary reference flow, which will also work as a lifting of the inhomogeneous Dirichlet boundary values, is used to define the DDN and RDDN conditions. Our aim is the minimization of a cost functional of velocity tracking type by means of a control localized on the boundary. We prove the existence of a solution for this optimal control problem and, in the case of the RDDN condition, obtain the adjoint system and derive the corresponding first order optimality conditions. All results are obtained under appropriate assumptions on the size of the data and the controls, which, however, are less restrictive when compared with the case of a CDN outflow condition. This is a joint work with Pedro Nogueira and Jorge Tiago (IST, U Lisboa).