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Boundary control problem of a water waves system in a tank

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Here we are interested in the boundary control problem of the small-amplitude water waves system in a rectangular tank. The model actually we used here is a fully linear and fully dispersive approximation of Zakharov-Craig-Sulem formulation constrained in a rectangle, in particular, with a wave maker. The wave maker acts on one lateral boundary, by imposing the acceleration of the fluid in the horizontal direction, as a scalar input signal.
Firstly, we introduce the Dirichlet to Neumann and Neumann to Neumann maps, asscociated to the certain edges of the domain, so that the system reduces to a well-posed linear control system. Then we consider the stabilizability issue on the gravity and gravity-capillary waves. It turns out that, in both cases, there exists a feedback functional, such that the corresponding control system is strongly stable. Finally, we consider the asymptotic behaviour of the above system in shallow water regime, i.e. the horizontal scale of the domain is much larger than the typical water depth. We prove that the solution of the water waves system converges to the solution of the one dimensional wave equation with Neumann boundary control, when taking the shallowness limit. Our approach is based on a detailed analysis of the Fourier series and the dimensionless version of the evolution operators mentioned above, as well as a scattering semigroup and the Trotter-Kato approximation theorem. This is a joint work with M. Tucsnak (Bordeaux) and G. Weiss (Tel Aviv).

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