On Periodic Trajectories of Boundary-Controlled Nonlinear Euler Equations

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A mathematical model of gas flow in a pipeline controlled by the inlet pressure and the outlet mass flow flux is considered in the form of the isothermal Euler equations with an appropriate equation of state. Within the framework of boundary control systems, this model is transformed into a nonlinear abstract differential equation using an appropriate lifting operator. For this abstract equation, a representation in terms of Fourier coefficients is derived analytically. Conditions for the existence of periodic solutions to a broad class of nonlinear control systems with continuously differentiable controls are established in abstract spaces. This framework is applied to a realistic hydrogen transport model to evaluate periodic operating regimes under periodic fluctuations in supply and demand. This talk is based on [1].

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Literatur

[1] Zuyev, A.; Benner, P.: Boundary control and periodic trajectories of semilinear Euler equations with application to hydrogen transport, arXiv preprint arXiv:2607.20948, 2026.