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EIGENMODE ANALYSIS OF THE TWO-DIMENSIONAL COMPRESSIBLE EULER EQUATIONS

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To impose boundary conditions, data at the boundaries must be known, and consequently measurements of the imposed quantities must be available. We consider the two most commonly used inflow boundary conditions with available data for internal flow calculations: the specification of the total temperature and total pressure.

We use the energy method to prove that the specification of the total temperature and the total pressure together with the tangential velocity at an inflow boundary lead to well-posedness for the linearized compressible Euler equations.

Next, these equations are discretized in space using high-order finite-difference operators on summation-by-parts form, and the boundary conditions are weakly imposed [1]. The implementation of the corresponding nonlinear equations is verified with the method of manufactured solutions.

We also derive the spectrum for the continuous problem and show how to predict the convergence rate to steady state [2]. Finally, nonlinear steady-state computations are performed, and they confirm the predicted convergence rates.

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