

ADMITTANCE BOUNDARY CONDITIONS

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ABSTRACT

Computational time is an important factor in numerical simulations. Cases arise when a region of the domain needs a very accurate simulation technique. Other regions might not require that level of accuracy. This situation is more prominent in long pipe like geometries with a cavity.

A way to handle this is to cut a part of the domain and account for the missing domain with a simpler model. This may require modifying the inflow boundary condition of the cut domain. In this work, we consider one such boundary condition which we will refer to as an “Admittance Boundary Condition”. This study presents two approaches of treating the inflow boundary condition. One is an iterative explicit method and the other is an implicit method. In the explicit method, the inflow velocity of the cut domain is modified at each iteration using an expansion technique. In the implicit method, a projection is performed on the residuals and matrix-vector product before linear solve of the system. Pseudo-compressible formulation is used to solve Navier-Stokes equations for the flow solution.

At the end, we present results obtained with above two approaches with various test cases. We compare these results with the full domain simulation data to assess the effect of the new approach.