RECENT ADVANCES IN PRESSURE-VELOCITY COUPLED SOLVER

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Recent advances in implicitly coupled pressure-velocity algorithm are presented. A second-order collocated finite volume method on arbitrary polihedral cells is used to discretise the governing equations: the momentum and pressure equations. The pressure equation is derived by recognising the Schur-complement of the governing system. The pressure and momentum equations are inserted into a block matrix, having each coefficient as a four by four tensor.
Boundary conditions derived for the specific use in the coupled solver are presented and validated. Generalized grid interface [1] developed for the coupled solver is presented. The interface is used to couple multiple non-conformal regions into a single contiguous domain at the matrix level. Flow through a centrifugal pump, a typical case where GGI is needed for the interface between the rotor and stator is calculated using the coupled solver. A novel possibility of consistent Picard linearisation of convection term is shown [2], which leads to faster convergence of the coupled solver. Considering the properties of the matrix, mainly the diagonal dominance, performance of algebraic multigrid solver [3] is examined and advances in additive correction multigrid cycle [4] are presented as well. The performance of the solver is shown for various test cases with incompressible external and internal flows.

References

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