

# Algebraic Multigrid Methods for Velocity Pressure Coupling in CFD

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In standard commercial Computational Fluid Dynamics (CFD) programs the Navier-Stokes equations are solved using the SIMPLE algorithm, which is a segregated approach that solves only for one single physical unknown at a time (velocity, pressure).

Here a coupled approach is investigated where velocity and pressure equation are solved simultaneously, which leads to a block matrix system. For both segregated and coupled approach we use Algebraic Multigrid Methods as preconditioner. We compare the two approaches regarding convergence and robustness with respect to mesh size and quality. Further we investigate the application of block preconditioners for the matrix which arises from the coupled approach.

The velocity pressure coupling is implemented in the framework of the CFD software AVL FIRE®. We illustrate our results by industrial benchmark examples.