# Optimal Schur methods (Neumann-Neumann or FETI type methods) for systems of PDEs

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## Abstract

We focus on domain decomposition methods for systems of PDEs (versus scalar PDEs). The Smith factorization (a "pure" algebra tool) is used systematically to derive new domain decompositions methods for symmetric and unsymmetric systems of PDEs: the compressible Euler equations, the Stokes and Oseen (linearized Navier-Stokes) problem. We will focus on the Stokes system. In two dimensions the key idea is the transformation of the Stokes problem into a scalar bi-harmonic problem. We show, how a proposed domain decomposition method for the bi-harmonic problem leads to a domain decomposition method for the Stokes equations which inherits the convergence behavior of the scalar problem. Thus, it is sufficient to study the convergence of the scalar algorithm. The same procedure can also be applied to the three-dimensional Stokes problem.