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Cyclic Reduction and Multigrid

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Cyclic reduction is a process by which red/black ordering is initially applied, and then the unknowns that correspond to one of the unknowns are eliminated. The resulting operator is a Schur complement matrix that is easy to construct if a 5-pt (7-pt) computational molecule was originally used in 2D (3D) on the fine mesh. In this talk we show analytically and experimentally that in fact the cyclically reduced operator has very good h-ellipticity properties. We discuss various ways of using the operator as an effective smoother for convection-diffusion equations.