Comparison of various modified incomplete block preconditioners

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We consider block tridiagonal matrices of the form

\[ A = \begin{pmatrix} A_1 & B_1 \\ C_1 & \ddots & \ddots \\ \vdots & \ddots & B_{M-1} \\ C_{M-1} & \cdots & A_M \end{pmatrix}. \]

Incomplete block factorizations for \( A \) can be derived in three different forms. We can factorize \( A \) by \( A = L^* T^* U \) with lower/upper block triangular \( L \) and \( U \), and \( T \) either the identity matrix, block diagonal, or the inverse of a block diagonal matrix. For each factorization we get equations defining the blocks of \( L \), \( U \), and \( T \) uniquely. To obtain sparsity we use only sparse approximations for \( L \), \( T \), and \( U \). Then the computations are based on incomplete factorizations, sparse approximate solutions of linear systems, and sparse approximate Schur complements. For modified incomplete block factorizations we want to obtain the behaviour of the preconditioner relative to the vector of all ones. Therefore, we will use also modified approximations for the partial problems, e.g. MILU or MSPAI with probing. In this talk we want to compare different methods for solving these problems for the three different variations of modified incomplete block preconditioners. Especially we consider MILU where we allow lumping also on nondiagonal positions, and Frobenius norm probing.

References

