ON HYPERGRAPH-PARTITIONING BASED
FILL REDUCING METHODS

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We discuss the use of hypergraph partitioning based methods for fill-reducing ordering of sparse matrices in Cholesky, LU and QR factorizations. For the Cholesky factorization case, we investigate a recent result on pattern-wise decomposition of sparse matrices, generalize the result, and develop algorithmic tools to obtain effective ordering methods. The generalized results help us formulate the ordering problem in LU as we do in the Cholesky case, without ever symmetrizing the given matrix $\mathbf{A}$ as $|\mathbf{A}| + |\mathbf{A}^T|$ or $|\mathbf{A}^T||\mathbf{A}|$. For the QR factorization case, we adapt a recently proposed technique to use hypergraph models in a fairly standard manner. The method again does not form the possibly much denser matrix $|\mathbf{A}^T||\mathbf{A}|$. We will see comparisons with the most common alternatives in all three cases.

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