Computing approximate LU decompositions of FE discretizations with almost linear complexity

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Although the asymptotic complexity of direct methods for the solution of large sparse finite element systems arising from second-order elliptic partial differential operators is far from being optimal, these methods are often preferred over modern iterative methods. This is mainly due to their robustness. In this article it is shown that an (approximate) *LU* decomposition can be computed in the algebra of hierarchical matrices with almost linear complexity and with the same robustness as the classical *LU* decomposition.

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