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An Experimental Evaluation of Iterative Solvers for Large SPD Systems of Linear Equations.

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Direct methods for solving sparse systems of linear equations are fast and robust, but can consume an impractical amount of memory, particularly for large three-dimensional problems. Preconditioned iterative solvers have the potential to solve very large systems with a fraction of the memory used by direct methods. The diversity of preconditioners makes it difficult to analyze them in a unified theoretical model. Hence, a systematic evaluation of existing preconditioned iterative solvers is necessary to identify the relative advantages of iterative methods and to guide future efforts. We present the results of a comprehensive experimental study of the most popular preconditioner and iterative solver combinations for symmetric positive-definite systems. A detailed comparison of the preconditioners, the iterative solver packages, and a state-of-the-art direct solver gives interesting insights into their strengths and weaknesses. We believe that these results would be useful to researchers developing preconditioners and iterative solvers as well as practitioners looking for appropriate sparse solvers for their applications.