

A New Implementation of Sparse Matrix-Vector Multiplication in the Parallel Finite Element Method

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A new implementation of sparse matrix-vector multiplication in the parallel finite element method is proposed in this work. The implementation is based on a new storage format for the sparse matrix. We call it Diagonal Block Compressed Sparse Row (DBC SR). The idea of the format is to exploit the dense block of the matrix with a prespecified size and to store the diagonal block first. Exploiting the dense block reduces the number of load operations as well as memory requirements, because only one index per block is required. Moreover no index is required for the diagonal block. The format is compared with a variety of compressed storage formats, for the sparse matrix produced in the parallel finite element analysis of elasticity problems. About 20% time and 15% memory are saved using the DBC SR compared to other formats.

Keywords: sparse matrix, block compressed sparse row, matrix-vector product, elasticity problems.

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