# A parallel factorization for generating orthogonal matrices

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A new factorization of orthogonal matrices is proposed that is based on Givens-Jacobi rotations but not on the QR decomposition. Rotations are arranged more uniformly than in the known factorizations that use them, which allows for computing more rotations in parallel, and fewer layers of concurrent rotations are necessary to model a matrix. So throughput can be increased, and latency can be reduced, compared to the known solutions, even though the obtainable gains highly depend on application specificity, software/hardware architecture and matrix size. The proposed approach allows for developing more efficient algorithms and hardware for generating random matrices, for optimizing matrices, and for processing data with orthogonal transformations. We have evaluated it in the context of a multithreaded Java application for generating random orthogonal matrices.

**Keywords:** matrix, factorization, orthogonal, random, parallel, concurrent, Givens, rotation, qr decomposition.