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Christopher M. Brislawn* (brislawn@lanl.gov), Mail Stop B265, Los Alamos National Laboratory, Los Alamos, NM 87545-1663. *Uniqueness of Lifting Factorizations for Linear Phase Filter Banks and Wavelets*. Preliminary report.

Linear phase FIR filter banks, or discrete wavelet transforms, form an integral part of the ISO/IEC JPEG 2000 image coding standard, in which they are specified in terms of lifting factorizations. Lifting corresponds to factorization of the filter bank's polyphase transfer matrix into alternating lower and upper triangular unimodular lifting matrices. Daubechies and Sweldens showed that any FIR perfect reconstruction filter bank has such a decomposition via an application of the Euclidean algorithm. Recent research by the author has shown that any whole-sample symmetric (FIR type 1 linear phase) filter bank can always be factored completely using half-sample symmetric (FIR type 2 linear phase) lifting filters. The structure theory for half-sample symmetric filter banks is more complicated, involving whole-sample antisymmetric (FIR type 3 linear phase) lifting filters and an equal-length half-sample symmetric base filter bank. New results based on a theory of "group lifting structures" show that these linear phase filter bank factorizations are also unique, a rather surprising result given that lifting factorizations are highly nonunique in general. These results make use of the group-theoretic structure of lifting factorizations and linear phase filter banks. (Received August 18, 2007)