1137-42-240 **Christopher M. Brislawn*** (cbrislawn@yahoo.com), 55 Paseo Encantado NE, Santa Fe, NM 87506. *A Diophantine approach to causal lifting factorization of discrete wavelet transforms.*

The theory of linear Diophantine equations over polynomial rings is applied to the problem of constructing causal lifting factorizations for two-channel FIR perfect reconstruction multirate filter banks and discrete wavelet transforms. The Diophantine approach leads to a fundamental result, the Linear Diophantine Degree-Reduction Theorem, that guarantees existence and uniqueness of causal lifting factorizations satisfying certain polynomial degree-reducing inequalities. This enables a new lifting factorization strategy called the Causal Complementation Algorithm that provides an alternative to the noncausal lifting scheme, based on the Extended Euclidean Algorithm, constructed by Daubechies and Sweldens. The new approach develops a generalization of polynomial division that ensures existence and uniqueness of quotients whose remainders satisfy user-specified divisibility constraints. The Causal Complementation Algorithm is shown to be more general than the Euclidean Algorithm approach by generating causal lifting factorizations not obtainable using the Euclidean Algorithm. Despite this greater generality, the uniqueness aspects of the underlying algebraic theory allow users to construct all possible degree-reducing causal lifting factorizations of a given filter bank. (Received February 05, 2018)