Meeting: 1001, Evanston, Illinois, SS 5A, Special Session on Codes and Applications

1001-94-360 **Faramarz Fekri*** (fekri@ece.gatech.edu), 777 Atlantic Dr., Georgia Tech, Atlanta, GA 30332-0250, **Farshid Delgosha** (farshid@ece.gatech.edu), 777 Atlantic Dr., Georgia Tech, Atlanta, GA 30332-0250, and **Mina Sartipi** (gtg435c@prism.gatech.edu), 777 Atlantic Dr., Georgia Tech, Atlanta, GA 30332-0250. *Results on Finite-Field Wavelets and Their Applications to Error Correcting Codes.*

This work explores the intersection of finite-field wavelet transforms and error-correcting codes. We first develop the theory of multi-dimensional filter banks over fields of characteristic two which provides a general wavelet decomposition of sequences defined over these fields. One method to design a filter bank is to factor its polyphase representation into the product of elementary matrices that are fully parameterized. This factorization is always possible when the polyphase matrices are one-dimensional and paraunitary over finite fields of characteristic two. We extend the results to two-dimensional paraunitary filter banks over these fields. Along with the wavelet theory, this work presents the applications of this theory to error-correcting codes. It derives wavelet representations of many previously known codes such as self-dual codes, MDS codes, rate-adaptive codes, and time-varying convolutional codes with k-partite trellis graphs. It also present two-dimensional lattice-cyclic wavelet codes (TDWC's). It introduces a methodology to design TDWC's over binary erasure channels. It shows that half-rate TDWC's of dimensions $N_1 \times N_2$ can recover burst erasures of size up to $N_1 \times N_2/2$,$N_1/2 \times N_2$, and $N_2/2 \times N_2$. (Received August 31, 2004)