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

1001-94-264 **Olgica Milenkovic*** (milenkov@colorado.edu), University of Colorado, ECE Dept., ECOT 253, 425 UCB, Boulder, CO 80305. *Problems in Combinatorial and Number Theory Related to LDPC Code Construction.*

Random-like Low-Density Parity-Check (LDPC) codes represent a class of linear block codes with an unprecedented potential for approaching the optimal error-rate performance over a wide variety of communication channels. Despite this fact, for most practical applications of interest, the implementation complexity of random code graphs is prohibitively large. This introduces the problem of designing LDPC codes with a mathematical structure that allows both for good error-correcting performance and for reduced complexity implementations. In this talk, we will describe some new problems in combinatorial and number theory arising in the process of designing practical and highly structured LDPC coding schemes. These involve: 1) Problems in Ramsey theory on integer sequences, such as estimating the density and constructing some new partition regular sequences. 2) Problems in the theory of Difference and Sidon Sets, including construction methods for a new class of Cycle-Invariant Difference Sets. 3) Problems regarding representations of finite fields. Here, one seeks matrix field representations with the smallest number of cycles in their corresponding Tanner graphs. (Received August 28, 2004)