Reduced complexity optimum detector for block data transmission systems

Block Data Transmission Systems (BDTS) are used in high-speed wireless communication systems with time dispersive channel characteristics. In such systems, blocks of data are separated by zeros to mitigate the effect of Inter-Symbol-Interference (ISI) between the blocks. An optimal detection process employs the Maximum Likelihood Block Detection (MLBD) technique on each block individually in the presence of ISI and Gaussian noise based on the Euclidean distance as an objective function. The detection process is computationally expensive therefore Genetic Algorithms have been used to reduce the overall design complexity. In this work, three types of Genetic Algorithms have been incorporated in the detection process i.e. the conventional GA, Micro GA(μGA), and Hybrid μGA to reduce computational load. In particular, a novel training method for Hybrid μGA has been proposed. Simulation results at 10dB channel SNR for the BDTS with Hybrid μGA executes as low as 3,750 number of objective functions evaluation for a block size of 20. The Bit Error Rate (BER) performance of this system is relatively good i.e. around 1dB inferior to the BDTS using the Exhaustive Search method that requires as many as 2^{20} number of objective functions evaluation.