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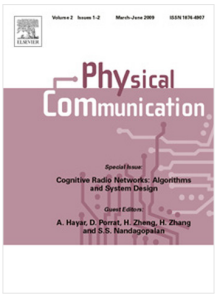

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Modified Switching DE Algorithm to Facilitate Reduction of PAPR in OFDM Systems

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***Abstract*- Partial Transmit Sequence (PTS) currently can be regarded as an extremely attractive and popular method which allows the achievement of very good Peak to Average Power Ratio (PAPR) reduction for signals that have undergone Orthogonal Frequency Division Multiplexing (OFDM), while also is being a technique which does not distort the signals being processed. In this method, a comprehensive search is conducted taking into account all possible combinations of phase-factors that can occur, leading to an increasing complexity of computation with respect to increasing in sub-blocks. The current paper outlines a novel low complexity sub-optimal PTS technique with its basis in an altered implementation of Differential Evolution (DE) algorithm shortly MBLX-DE which significantly diminishes the PAPR of OFDM signals. More specifically SWDE_Sucess_MBLX (Switched parameter Differential Evolution with success based mutation and modified blending crossover) algorithm [28] is modified in an efficient way and has been implemented for the PTS scheme. The proposed algorithm introduces modifications in three stages of SWDE_Sucess_MBLX like population central tendency based mutation scheme is incorporated along with the success based mutation, a random selection between two cross-over strategies with blending rate concept and threshold-based selection. A theoretical performance study with general formulas of the proposed scheme is presented and a comparative analysis is done with existing algorithms. Extensive simulation results demonstrate that our proposed method can substantially outperform against the currently best-known algorithms in the context of reduction of PAPR as well as performance in terms of complexity of the computations to be performed.**

***Keywords*- Orthogonal Frequency Division Multiplexing (OFDM), Peak to Average Power Ratio (PAPR), Partial Transmit Sequence (PTS), Differential Evolution (DE), Blending Crossover (BLX), Parameter Switching (SW).**

1. INTRODUCTION

ORTHOGONAL Frequency Division Multiplexing (OFDM) is extremely attractive as a technique for multicarrier modulation which has seen extensive use in many systems carrying out high-speed wireless communication, since it is robust against multipath fading and tolerance of narrowband interference [1]. In spite of its advantages, a major drawback pertaining to OFDM systems is the high values of PAPR of the signals transmitted by the system, which is especially significant in cases when many subcarriers are used in such a scheme. Such high value of PAPR degrades system power efficiency, causes distortion of signals in-band and spurious radiation out-of-band caused by noisy saturation in the high power amplifier (HPA).So the main goal of the wireless OFDM system is to achieve minimum PAPR with reduced complexity.

Many methods have been proposed in recent times with the goal of reducing PAPR for OFDM systems, which include methods of coding [2], clipping and filtering technique [4], companding [5], Tone reservation [6], Active Constellation Extension (ACE) [7], distortionless techniques like selective mapping (SLM) [8] and PTS [9-23]. So, it is difficult to demonstrate which PTS technique gives the best CCDF of PAPR with least computational complexity. From existing research works it is observed that in case of different PTS schemes, the CCDF of their PAPR performances is found to vary according to the different modulation techniques like Quadrature Amplitude Modulation (QAM) and Quadrature Phase Shift Keying (QPSK) and different simulation parameters (No of sub-block, phase weighting factors, and others) also. Hence, our main goal is improving the PAPR reduction performance with a low complexity of computation of multicarrier communication systems while at the same time not disturbing the other part of the systems. Therefore for further reduction of PAPR and significant minimization of search complexity, SWDE_Sucess_MBLX [28] is modified and implemented in PTS scheme.

In our proposed work a novel population central tendency based mutation scheme is incorporated along with the success based mutation, blending rate concept demonstrated in success-based selection between two different crossover schemes and finally a novel threshold based selection is employed. The scheme proposed by us surpasses the existing schemes based on PTS with regard to the reduction of PAPR and complexity of computation. The theoretical analysis algorithm descriptions and sufficient simulation results regarding the CCDF of the PAPR, BER versus SNR comparisons over the different communication channels