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A Hybrid Particle Swarm Optimization Technique for Adaptive Equalization
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Abstract
Adaptive equalization mitigates the distortions caused by radio channels. The least mean square (LMS) and the recursive least squares (RLS) algorithms are used for such purpose. Recently, particle swarm optimization (PSO) algorithms such as PSO using a linear time decreasing inertia weight (PSO-W) and the PSO using constant constriction factor (PSO-CCF) were shown to be very effective in handling systems having nonlinear behavior. However, these algorithms can be trapped in local minima. This paper presents a new PSO-based algorithm called the hybrid PSO (HPSO) that is capable to handle such problems. The HPSO includes the randomization of particles to improve the search capacity of the swarm, which in turn reduces the probability of being trapped in some local minima. It also adapts the inertia weight assignment to the particles. Extensive simulation results are conducted to confirm the consistency in the performance of the HPSO algorithm in different scenarios. The proposed HPSO secures the minimum steady-state error as compared to LMS and other PSO-based algorithms in both nonlinear and linear channels. Finally, the proposed HPSO algorithm shows a great improvements in Bit Error Rate and convergence rate. © 2018, King Fahd University of Petroleum & Minerals.

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