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USING *A PRIORI* INFORMATION TO REDUCE THE COMPUTATIONAL COMPLEXITY OF RBF-ASSISTED TURBO EQUALIZATION

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Abstract. *This paper presents a straightforward and efficient reduced-complexity radial basis function (RBF)-assisted decision-feedback equalizer (DFE)-based turbo equalization (TEQ) scheme, which utilizes the a priori information provided by the channel decoder to significantly reduce the computational complexity of the RBF-based DFE. The proposed scheme is capable of achieving a close performance to the Jacobian RBF DFE TEQ in the context of both binary phase-shift keying (BPSK) modulation and 4 quadrature amplitude modulation (QAM), when communicating over dispersive Rayleigh fading channels. Furthermore, it attains a factor 3 and 4.38 lower computational complexity associated with the addition/subtraction operations compared to the Jacobian RBF DFE TEQ for BPSK and 4QAM, respectively. In addition, the complexity reduction factor associated with the multiplication/division/exp(·)/ln(·) operations is 1.14 and 2.53 for BPSK and 4QAM, respectively.*

Keywords: *A priori* information, Decision-feedback equalizer (DFE), Turbo equalization (TEQ), Radial basis function (RBF)

1. **Introduction.** Adaptive channel equalization is invoked in order to alleviate the effects of intersymbol interference (ISI), when communicating over frequency selective channels. Instead of performing the equalization and decoding independently, turbo equalization (TEQ) [1-3] invokes an iterative exchange of extrinsic information between a soft-in/soft-out (SISO) equalizer and a SISO decoder in order to improve the receiver's performance. According to the mechanism for implementing a component equalizer, two types of soft-output equalization are available: trellis-based equalization and symbol decision equalization in the context of TEQ. Previous TEQ research has employed the soft-output Viterbi algorithm (SOVA) [1,3,4] and the optimal maximum *a posteriori* (MAP) algorithm [2,3,5] to implement trellis-based component equalizers and utilized linear filters [6,7] and radial basis function (RBF)-based equalizers [8] to implement symbol decision component equalizers. Symbol decision equalizers are simpler and computationally less