

学术报告会

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Single Carrier Frequency-domain Turbo Equalization: Theory and Application

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Abstract:

Single-carrier frequency-domain turbo equalization (SC-FDTE) is investigated for MIMO systems, with the focus on the design of soft-decision frequency-domain equalizer (SD-FDE) under minimum mean square error (MMSE) criteria. Existing SD-FDEs perform equalization on each frequency bin individually, which however only achieves suboptimal performance, and with the availability of the a priori input, block-wise operation is required to achieve optimal performance. Optimal MMSE SD-FDE designs with three soft interference cancellation (SIC) schemes are introduced. The first SIC scheme, SIC-I, utilizes the a priori knowledge from the channel decoder, the second SIC scheme, SIC-II, relies on the decoder a priori knowledge as well as the symbol-wise a posteriori soft-decision feedback of the SD-FDE itself, and the third SIC scheme, SIC-III, is comparable to the SIC-II while with a block-wise soft-decision feedback. The optimal SD-FDEs incur high computation complexity due to block-wise processing, then a suboptimal bin-wise SD-FDE with SIC-III is proposed to achieve complexity-performance tradeoff. It is shown the suboptimal SD-FDE with SIC-III considerably outperforms existing suboptimal SD-FDE with SIC-I, while at a similar magnitude of complexity. Compared to the optimal SD-FDE with SIC-III, the performance loss is marginal. The proposed scheme was tested by field trial data collected in underwater acoustic communication experiments, showing significant performance gain over conventional non-iterative equalization scheme, especially for high modulation and spatial multiplexing.

Biography:

Jun Tao is with the School of Information Science and Engineering, Southeast University, Nanjing, China. Now he is a professor. His research interest is in turbo equalization, underwater acoustic communication, UMTS/LTE baseband algorithm design and verification for ASIC. From 2011-2015 he was a Senior Engineer, Qualcomm Inc., Boulder, CO, USA. Jun Tao has a Ph.D. in Electrical & Computer Engineering, from the University of Missouri-Columbia.