

Evaluation and optimization of DRC-based PAPR-reduction within the DVB-T2 Common Simulation Platform

Final year project proposal

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1 Background

Orthogonal Frequency-Division Multiplexing (OFDM) is a spectrally efficient multicarrier modulation scheme, which is employed in the most advanced high-speed wireless communication systems, such as Digital Video Broadcasting (DVB) or Long-Term Evolution (LTE). However, one of its biggest shortcomings is that it produces a signal with a high Peak-to-Average Power Ratio (PAPR), which is undesirable for several reasons. This issue has been subject to a lot of research effort over the last decades. Several solutions have been proposed in the past [2, 3]. More recently, a different approach borrowed from audio signal processing was presented [1]. In a pilot experiment, the authors were able to demonstrate its applicability to a noise-free communication channel. The main purpose of the cited pilot experiment was to showcase that Dynamic Range Compression (DRC), if properly parametrized, can also be applied to OFDM signals, which unlike highly correlated audio signals possess a spectrum similar to white noise.

2 Scope

So far, this approach has not been validated in a more realistic scenario, in which the channel corrupts the transfer signal. Therefore, the main task of the project is to evaluate the DRC-based approach with various channel models and different digital modulation schemes (QPSK, etc.), and also to compare its performance with other PAPR-reduction techniques. For this purpose, the DVB-T2 Common Simulation Platform should be used. It is a publicly available MATLAB model of an end-to-end chain compliant with the DVB-T2 standard [4]. If deemed to be promising, optimal operating points for the various use cases shall be determined in the form of a tradeoff between PAPR gain and Bit Error Rate (BER).

3 References

[1] S. Gorlow and Z. Kollár, “Peak-to-average power ratio reduction for OFDM based on dynamic range compression,” in Proc. IEEE BMSB 2015, 2015.

[2] S. H. Han and J. H. Lee, "An overview of peak-to-average power ratio reduction techniques for multicarrier transmission," *Wireless Commun.*, vol. 12, no. 2, 2005.

[3] T. Jiang and Y. Wu, "An overview: Peak-to-average power ratio reduction techniques for OFDM signals," *IEEE Trans. Broadcast.*, vol. 54, no. 2, 2008.

[4] ETSI, "Digital Video Broadcasting (DVB); Frame structure channel coding and modulation for a second generation digital terrestrial television broadcasting system (DVB-T2)," ETSI EN 302 755 V1.4.1, 2015.

4 Requirements

Communication theory, signal processing, MATLAB

5 Contact

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