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Use of Asymmetrical Advance coding for 802.11g and 802.11NG

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Author: Juan Alberto Torres, Ph. D.; Victor Demjanenko, Ph. D. & Jeff Paul
VOCAL Technologies, Ltd. (http://www.vocal.com)
200 John James Audubon Parkway Buffalo, NY, 14228
Phone: (716) 688 4675
Fax: (716) 639 0713
e-Mail: jatorres@vocal.com; victord@vocal.com jeffpaul@vocal.com

Abstract

This paper proposes the use of Asymmetrical Advanced Coding Techniques (AACT) for the 802.11g and the 802.11NG. Theses Asymmetrical Advance Coding Techniques have the main purpose of saving power in the mobile device.

Discussion

The benefit of Asymmetrical coding is to reduce the power consumption in the mobile device. The transmitter in the mobile device will use a coding technique that requires less computational power in the encoding, and the receiver in the mobile device will use a coding technique that requires less computational power in the decoding.

Turbo Codes (TC) and Low Density Parity Check Codes (LDPC) are Advanced Coding Techniques that allow communication close to the capacity of the channel or theoretical limit (Shannon limit). Each has its advantages and disadvantages.

TC is simple in the transmitter; the only “extra“ device used with respect to a single Convolutional Code is an interleaver. In the receiver, TC is more complex, requiring two receivers working in parallel interchanging information, both performing a number of iterations. These iterations need additional computation, time and memory. In some cases, TC can have a called “error floor” that reduce the effectiveness of the codes for high Signal to Noise Ratio (SNR). The “error floor” can be avoided using an appropriate interleaver design.

LDPC codes are complex in the transmitter, where the transmitter needs to determine a good LDPC matrix. It has been proven that with big matrices (in the order of 1 Million of bits), it is possible to be as close as 0.0045 dB from the Shannon limit. In the receiver, LDPC codes are easy to decode using the sum-product algorithm (linear code).

It is clear that these two techniques are complementary to each other. TC fits well in systems where the encoding must be simple to save power. LDPC fits in systems where the decoding must be simple to save power. Taking this into account, for handset or mobile devices, where power consumption is important, one could use TC in the uplink (sending data) and LDPC codes in the downlink (receiving data) to optimize for power consumption. The access point or base station equipment is usually powered from a standard AC source and the power consumption is not as significant of an issue.

We would like to collaborate with other organizations for a joint proposal to the 802.11 that uses these Asymmetrical Advance Coding Techniques.