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Abstract	LDPC coding for OFDMA PHY
Purpose	Discussion, Decision and Adoption
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LDPC coding for OFDMA PHY

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Overview

An informal LDPC group, including Motorola, Nokia, Intel, Samsung, TI, Nortel Networks, etc, has been working on the goal of achieving consensus on a proposed LDPC code design as an optional advanced code for the OFDMA PHY. Many excellent code designs have been submitted, see [1,2] and references therein. The codes have a very similar structure and have been qualitatively and quantitatively characterized as well as excellent flexibility and performance. Based on the particular structure of proposed LDPC codes, direct encoding methods are presented with low encoding complexity in IEEE P802.16e/D5a. However, the methods given there compute the parity check bits one-by-one, hence they will result in large coding latency, especially for the long LDPC codes, which is undesirable from the view point of implementation. This contribution provides a parallel encoding method to significantly reduce the coding latency while keeping the low encoding complexity. Additional LDPC specification text is proposed.

Recommended Text Changes:

<Add the material below directly following the figure 1 in 8.4.9.2.5.2…>

Method 3 Parallel encoding method

Our method is very similar to method 1 but all parity check parity bits are concurrently generated as follows

1) The parity check bits $v(0) \sim v(x)$ are computed by

$$v(i) = \sum_{j=0}^{k_b-1} \left(\sum_{q=i}^{m_b-1} P_{p(q,j)} \right) u(j) \quad i = 0, \mathrm{L}\ , x \qquad (1)$$

2) The parity check bits $v(x+1) \sim v(m_b - 1)$ are computed by

$$v(i) = \sum_{j=0}^{k_b-1} \left(\sum_{q=0}^{i-1} P_{p(q,j)} \right) u(j) \quad i = x+1, \mathrm{L}\ , m_b - 1 \qquad (2)$$

where x is the position of the middle 1 in the vector $\mathbf{h}_b$.

Since all parity check bits are computed at the same time, the coding latency can significantly reduce. In addition, $\left(\sum_{q=i}^{m_b-1} P_{p(q,j)} \right)$ in (1) and $\left(\sum_{q=0}^{i-1} P_{p(q,j)} \right)$ in (2) for all $j = 0, \mathrm{L}\ , k_b - 1$ are the summations of a mount of rows of H_{b1} which can be done beforehand. Therefore, our method has even lower encoding complexity.

Reference material

1 C80216e-04_373r1 LDPC coding for OFDMA PHY Brian Classon, Yufei Blankenship, Motorola
2 C802.16e-04/526r1 DPC coding for OFDMA PHY Brian Classon, Yufei Blankenship, Motorola