

Claims:

1. A method for channel decoding using a Low-Density Parity-Check (LDPC) code, the method comprising:

5 demodulating a signal transmitted from a transmitter;
determining position information of punctured parity bits by estimating information about a predetermined order of parity bit sets to be punctured and the number of parity bit sets; and

decoding data using the positions of the punctured parity bits,

10 wherein determining position information of punctured parity bits comprises:

determining a number of parity bits to be punctured;

determining a number of parity bit sets to be punctured based on the determined number of parity bits to be punctured; and

acquiring a predetermined order of parity bit sets.

15 2. The method of claim 1, wherein the predetermined order of parity bit sets to be punctured is determined as 6, 4, 13, 9, 18, 8, 15, 20, 5, 17, 2, 22, 24, 7, 12, 1, 16, 23, 14, 0, 21, 10, 19, 11, 3, when a codeword length is 16200 and an information length is 7200, a modulation scheme is 16-Quadrature Amplitude Modulation (16-QAM).

20 3. The method of claim 1, wherein the predetermined order of parity bit sets to be punctured is determined as 6, 15, 13, 10, 3, 17, 21, 8, 5, 19, 2, 23, 16, 24, 7, 18, 1, 12, 20, 0, 4, 14, 9, 11, 22, when a codeword length is 16200 and an information length is 7200, a modulation scheme is 64 Quadrature Amplitude Modulation (64-QAM).

25 4. The method of claim 1, wherein the step of determining positions of the punctured parity bits, comprises:

additionally determining positions of the remaining punctured parity bits when the number of the punctured bits is not a multiple of the number of parity bit sets.

30 5. The method of claims 1, wherein the number of parity bit sets is determined by below equation:

$$A = \left\lceil \frac{N_p}{M_1} \right\rceil,$$

35 where A denotes the number of parity bit sets for puncturing, N_p denotes a number of parity bits for puncturing, M_1 denotes the number of bits in one parity bit set.

6. The method of claims 5, wherein the parity bit sets are formed by below equation;

$$P_j = \{p_k | j \equiv k \bmod q, 0 \leq k < N_1 - K_1\},$$

where P_j denotes the j^{th} parity bit set, N_1 denotes a length of an LDPC codeword, K_1 denotes a length of an information word, M_1 denotes the number of bits in one parity bit set, q is a value satisfying $q = (N_1 - K_1) / M_1$, where K_1/M_1 is an integer, and $0 \leq j < q$.

7. An apparatus for channel decoding using a Low-Density Parity-Check (LDPC) code, the method comprising:

a demodulator for demodulating a signal transmitted from a transmitter;

a puncturing pattern estimator for determining position information of punctured parity bits by estimating information about a predetermined order of parity bit sets to be punctured and the number of parity bit sets; and

a decoder for decoding data using the positions of the punctured parity bits,

wherein determining position information of punctured parity bits comprises:

determining a number of parity bits to be punctured;

determining a number of parity bit sets to be punctured based on the determined number of parity bits to be punctured; and

acquiring a predetermined order of parity bit sets.

8. The apparatus of claim 7, wherein the predetermined order of parity bit sets to be punctured is determined as 6, 4, 13, 9, 18, 8, 15, 20, 5, 17, 2, 22, 24, 7, 12, 1, 16, 23, 14, 0, 21, 10, 19, 11, 3, when a codeword length is 16200 and an information length is 7200, a modulation scheme is 16-Quadrature Amplitude Modulation (16-QAM).

9. The apparatus of claim 7, wherein the predetermined order of parity bit sets to be punctured is determined as 6, 15, 13, 10, 3, 17, 21, 8, 5, 19, 2, 23, 16, 24, 7, 18, 1, 12, 20, 0, 4, 14, 9, 11, 22, when a codeword length is 16200 and an information length is 7200, a modulation scheme is 64 Quadrature Amplitude Modulation (64-QAM).

10. The apparatus of claim 7, wherein the puncturing pattern estimator is adapted to additionally determine positions of the remaining punctured parity bits when the number of the punctured bits is not a multiple of the number of parity bit sets.

11. The apparatus of claims 7, wherein the number of parity bit sets is determined by below equation:

$$A = \left\lfloor \frac{N_p}{M_1} \right\rfloor,$$

where A denotes the number of parity bit sets for puncturing, N_p denotes a number of parity bits for puncturing, M_1 denotes the number of bits in one parity bit set.

12. The apparatus of claims 11, wherein the parity bit sets are formed by below equation;

$$P_j = \{p_k \mid j \equiv k \bmod q, 0 \leq k < N_1 - K_1\},$$

where P_j denotes the j^{th} parity bit set, N_1 denotes a length of an LDPC codeword, K_1 denotes a length of an information word, M_1 denotes the number of bits in one parity bit set, q is a value satisfying $q = (N_1 - K_1) / M_1$, where K_1/M_1 is an integer, and $0 \leq j < q$.

13. A method for channel decoding, substantially as herein described with reference to the accompanying drawings.

14. An apparatus for channel decoding, substantially as herein described with reference to the accompanying drawings.

CLAIMS

1. A method for channel decoding using a low-density parity-check (LDPC) code, the method comprising:

- 5 demodulating a signal transmitted from a transmitter;
determining a number of punctured parity bits;
determining a number of punctured parity bit sets based on the determined number of the punctured parity bits;
acquiring a predetermined order of punctured parity bit sets;
0 determining position information of the punctured parity bits based on the predetermined order; and
decoding data using the position information of the punctured parity bits.

2. The method of claim 1, wherein the predetermined order of the punctured parity bit sets is 6, 4, 13, 9, 18, 8, 15, 20, 5, 17, 2, 22, 24, 7, 12, 1, 16, 23, 14, 0, 21, 10, 19, 11, 3, when a codeword length is 16200 and an information length is 7200, a modulation scheme is 16-quadrature amplitude modulation (16-QAM).

3. The method of claim 1, wherein the predetermined order of the punctured parity bit sets is 6, 15, 13, 10, 3, 17, 21, 8, 5, 19, 2, 23, 16, 24, 7, 18, 1, 12, 20, 0, 4, 14, 9, 11, 22, when a codeword length is 16200 and an information length is 7200, a modulation scheme is 64 quadrature amplitude modulation (64-QAM).

4. The method of claim 1, wherein determining the position information of the punctured parity bits, comprises:
25 additionally determining positions of remaining punctured parity bits when the number of the punctured bits is not a multiple of the number of parity bit sets.

5. The method of claims 1, wherein the number of the punctured parity bit sets is determined by below equation:

$$A = \left\lfloor \frac{N_p}{M_1} \right\rfloor,$$

where A denotes the number of punctured parity bit sets, N_p denotes a number of punctured parity bits, M_1 denotes the number of bits in one parity bit set.

35 6. The method of claims 5, wherein the parity bit sets are formed by below equation;

$$P_j = \{p_k \mid j = k \bmod q, 0 \leq k < N_1 - K_1\},$$

where P_j denotes the j^{th} parity bit set, N_1 denotes a length of an LDPC codeword, K_1 denotes a length of an information word, M_1 denotes the number of bits in one parity bit set, q is a value satisfying $q = (N_1 - K_1) / M_1$, where K_1/M_1 is an integer, and $0 \leq j < q$.

5 7. An apparatus for channel decoding using a low-density parity-check (LDPC) code, the apparatus comprising:

a demodulator for demodulating a signal transmitted from a transmitter;

a puncturing pattern estimator for determining a number of punctured parity bits, determining a number of punctured parity bit sets based on the determined number of the
10 punctured parity bits, acquiring a predetermined order of punctured parity bit sets, and determining position information of the punctured parity bits based on the predetermined order; and

a decoder for decoding data using the position information of the punctured parity bits.

15 8. The apparatus of claim 7, wherein the predetermined order of the punctured parity bit sets is 6, 4, 13, 9, 18, 8, 15, 20, 5, 17, 2, 22, 24, 7, 12, 1, 16, 23, 14, 0, 21, 10, 19, 11, 3, when a codeword length is 16200 and an information length is 7200, a modulation scheme is 16-quadrature amplitude modulation (16-QAM).

20 9. The apparatus of claim 7, wherein the predetermined order of the punctured parity bit sets is 6, 15, 13, 10, 3, 17, 21, 8, 5, 19, 2, 23, 16, 24, 7, 18, 1, 12, 20, 0, 4, 14, 9, 11, 22, when a codeword length is 16200 and an information length is 7200, a modulation scheme is 64 quadrature amplitude modulation (64-QAM).

25 10. The apparatus of claim 7, wherein the puncturing pattern estimator is adapted to additionally determine positions of remaining punctured parity bits when the number of the punctured bits is not a multiple of the number of parity bit sets.

30 11. The apparatus of claims 7, wherein the number of the punctured parity bit sets is determined by below equation:

$$A = \left\lfloor \frac{N_p}{M_1} \right\rfloor,$$

where A denotes the number of the punctured parity bit sets, N_p denotes a number of the punctured parity bits, M_1 denotes the number of bits in one parity bit set.

35 12. The apparatus of claims 11, wherein the parity bit sets are formed by below equation;

$$P_j = \{p_k \mid j \equiv k \bmod q, 0 \leq k < N_1 - K_1\},$$

where P_j denotes the j^{th} parity bit set, N_i denotes a length of an LDPC codeword, K_i denotes a length of an information word, M_i denotes the number of bits in one parity bit set, q is a value satisfying $q = (N_i - K_i) / M_i$, where K_i/M_i is an integer, and $0 \leq j < q$.

5 13. A method for channel decoding, substantially as herein described with reference to the accompanying drawings.

14. An apparatus for channel decoding, substantially as herein described with reference to the accompanying drawings.

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