Double CRC-Aided Erasure Demodulation on M-ary Chirp Spread Spectrum Signal

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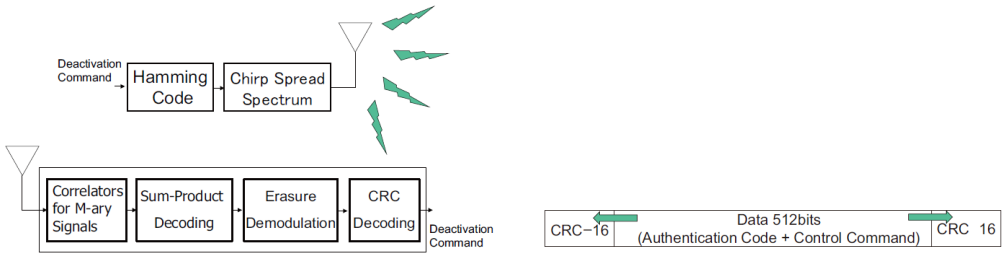
Double cyclic redundancy code (CRC)-aided erasure demodulation for a M-ary chirp spread spectrum signal is proposed in this paper. The erasure demodulation is possible to reduce a block error rate (BLER) and extend the communication range of a wireless system. In the erasure demodulation a demodulator regards a decoded bit as an erasure bit if its corresponding likelihood at the output of the decoder is smaller than a threshold. The demodulator outputs both "0" and "1" for the erasure bit and CRC error detection following the erasure demodulation checks which output is correct. As one of those outputs must be a correct bit, BLER performance improves. On the other hand, as the number of erasure bits increases, the number of CRC decoding operations grows exponentially and a CRC miss detection probability also increases. Thus, in this paper, a new CRC coding scheme for erasure demodulation is proposed. The proposed scheme applies CRC coding in forward and back directions of the bit sequence in a packet. The system model and the frame format of the proposed scheme are shown in Fig. 1.



(a) System model. (b) Frame format

Figure 1. System model and the frame format of the proposed scheme.

The numerical results obtained through computer simulation show that the miss detection packet probability is less than 1/100 as compared with the block error rate (BLER) even with the single CRC encoding. If the double CRC encoding is applied, the miss detection packet probability is smaller than 10^{-4} for any E_B/N_0 between 0 and 40 dB as shown in Fig. 2. Thus, it is also negligible as compared to the BLER on the Rayleigh fading channel.

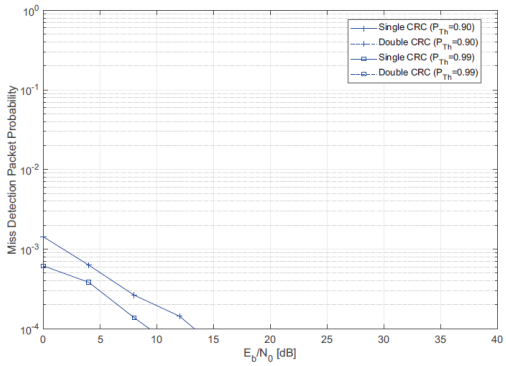


Figure 2. Miss detection packet probability performance (Rayleigh fading).

References

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