CRC-Aided Erasure Demodulation on Outputs of Sum-Product Decoding for Hamming Coded M-ary Chirp Spread Spectrum Signal

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SUMMARY This paper presents the performance of erasure demodulation applied to the outputs of sum-product decoding for a Hamming coded M-ary chirp spread spectrum signal. The threshold of the erasure demodulation has to be decided according to the computational capability of each IoT device, the target value of a block error rate, and the probability of CRC miss detection.

key words: *IoT Device, Cyclic Redundancy Check, Chirp Spread Spectrum*

1. Introduction

In this paper, a control system that transmits a deactivation command through low power wide area (LPWA) communication to IoT devices is assumed. The wireless communication system needs to recover a specific deactivation command when it is received[1]. Thus, erasure demodulation is applied following the sum-product decoding of a Hamming code.

2. System Model

The assumed system model is shown in Fig. 1. Different from [1], Hamming coding in the transmitter and sum-product decoding in the receiver are included. Following the LoRa standard, M-ary spread spectrum modulation is applied to the outputs of the Hamming code. In the receiver side, erasure demodulation is applied to the outputs of the sum-product decoding. If the output is less than a threshold, the receiver does not decide a decoded bit as "0" or "1" and cyclic redundancy check (CRC) decoding following the erasure demodulation checks which output is correct.

3. Numerical Results

The block error rate (BLER) performance of the assumed system on a Rician fading channel is shown in Fig. 2. The block error rate (BLER) improves as the threshold of the erasure demodulation, P_{Th}, increases. This implies that the receiver of the assumed system can extract the deactivation command at a longer distance from the transmitter though the number of CRC decoding operations increases.

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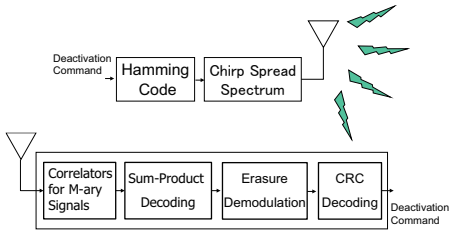

Fig. 1 System model.

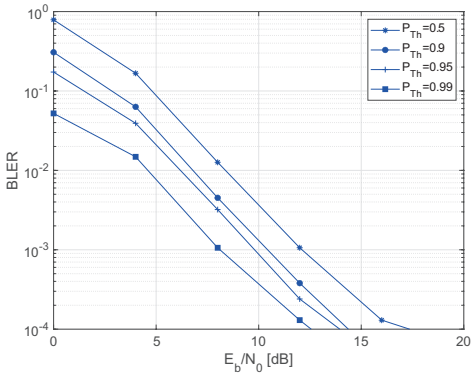

Fig. 2 BLER on Rician fading channel (Rician factor $k = 10$, No. of decoding iteration=24).

4. Conclusions

The performance of erasure demodulation applied to the outputs of sum-product decoding for the Hamming coded M-ary chirp spread spectrum signal is presented.

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References

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