COMBINED ERASURE-AND-ERROR DECODING ALGORITHM FOR RS-CODES AND ITS APPLICATION FOR M-FSK MODULATION

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For a long time, powerful algebraic BCH codes and its generalizations – Reed-Solomon codes – were used to suppress noise during data transmission. However, in 90-s random coding and decoding with the use of such code constructions as LDPC and turbo codes attracted particular attention of communication systems developers.

The use of iterative methods of information processing in these codes made it possible to approach the Shannon boundary when using soft decoding. However, in cases of data transmission (and not only), the time delay in the information processing is critical. Therefore, many engineering applications still use algebraic decoding techniques.

Error-correcting codes are used not only in communication systems, but also

in information security applications, where it is important to ensure access security with noisy input data. The structure of such systems was considered by us in [1]. It should be noted that in recent years, non-binary code constructions [2, 3] have attracted particular interest, which is explained by their flexibility of their structures and their high efficiency at a low signal-to-noise ratio.

In this paper, we consider the application of a modified combined erasure-and-error decoding method for RS codes using an iterative selection of the erasure vector based on an estimate of the noise level in the received signal. Unlike algebraic soft decoding of RS codes, our approach is closer to the stochastic method, described in [4].

The main difference of our work is that to find a suitable vector for decoding, we use an iterative search for the erasure vector by sorting the symbols of the code block in descending order of their reliability and waiting for a successful hard decoding based on the Berlekamp-Messi algorithm. It is important to note that the search for a suitable erasure vector is implemented using a symbol-by-symbol shift of the decoded codeword, which allows the entire decoder to be implemented in hardware. Simulation modeling of the proposed algorithm for data transmission with M-FSK modulation and (63, 13) RS-coding has been applied. The 2048-point DFT was used to get the reliability of the received symbols when searching for the erasure vector, giving the opportunity to obtain a coding gain of about 1 dB for BER = 1E-5 of data received.

The proposed algorithm is less efficient than Guruswami-Sudan and Kotter-Vardy soft decoding algorithms, however, it has a much simpler implementation and can be applied both in telecommunication and security systems

Literature

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