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Construction of m-Repeated Burst Error Detecting and Correcting Non-binary Linear Codes

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Abstract

Error correcting codes are required to ensure reliable communication of digitally encoded information. One of the areas of practical importance in which a parallel growth of the subject error correcting codes took place is that of burst error detecting and correcting codes. The nature of burst errors differs from channel to channel depending upon the behavior of channels or the kind of errors which occur during the process of transmission. The rate of transmission is efficient if the number of parity-check digits are as minimum as possible. It is usually not possible to give the exact number of parity-check digits required for a given code. However, bounds can be obtained over the number of parity-check digits. An upper bound for a linear code capable of detecting/ correcting burst errors or its variants is many a times established by the technique used to establish Varsharmov-Gilbert-Sacks bound by constructing a parity-check matrix for the requisite code. This technique not only ensures the existence of such a code but also gives a method for constructing such a code. The synthesis method using this technique is cumbersome and to the best of our knowledge, there is no systematic way to construct a parity-check matrix for a burst error correcting non-binary linear code. Extending the algorithm for binary linear codes given by the authors to non-binary codes, the paper proposes a new algorithm for constructing a parity-check matrix for any linear code over $GF(q)$ capable of detecting and correcting a new kind of burst error called 'm-repeated burst error of length b or less'. Codes based on the proposed algorithm have been illustrated.

Keywords: Error correcting code; burst error; repeated burst error; parity-check matrix

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