Concatenated Structure of q-abelian Codes and a Resulting Minimum Distance Bound

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Abstract

For a positive integer ℓ and a group algebra $\mathbb{F}_q[H]$, a *q-abelian code of index ℓ* is a $\mathbb{F}_q[H]$-submodule of $\mathbb{F}_q[H]^\ell$, where H is an abelian group of order m. The special case $H := \mathbb{Z}_m$, where $\mathbb{Z}_m$ is a cyclic group of order m, gives a quasi-cyclic (QC) code of index ℓ and length $m\ell$. So, q-abelian codes are natural generalization of QC codes. Sole and Ling showed that QC codes can be decomposed as a direct sum of certain linear codes of length ℓ by applying the Chinese Remainder Theorem, such a method is called the CRT decomposition. Jensen represented a concatenated structure of QC codes and later Guneri-Ozbudak showed that these decompositions are equivalent. In this talk, we present a concatenated structure of q-abelian codes by using the CRT decomposition of q-abelian codes introduced by Jitman and Ling and we show that both decompositions are equivalent. Concatenated structure also leads to asymtotical goodness and provides a general minimum distance bound, extending the analogue bound for QC codes due to Jensen.

Keywords: group algebra, concatenated codes, q-abelian codes, quasi-cyclic codes, CRT decomposition