Abstract

On Codes and Sequences Over Finite Rings

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Let R be a finite Frobenius ring with subring S. Let T be an S-module epimorphism $T : {}_S R \longrightarrow {}_S S$ whose kernel contains no non-trivial left ideal of R. We say that T is a trace map from R onto S. For any map $f : R \longrightarrow R$, we define the left S-linear code

$$C_f = \{c^f_{\alpha,\beta} : R \longrightarrow S : x \mapsto T(\alpha x + \beta f(x)) : \alpha, \beta \in R\}.$$

Let $\chi : S \longrightarrow \mathbb{C}^\times$ be a generating character on the additive group of S. The number of distinct homogeneous weights that appear in C_f depends on the number of different values of

$$W^f(\alpha, \beta) = \frac{1}{|S^\times|} \sum_{u \in S^\times} \sum_{x \in R} \chi(T(\alpha x + \beta f(x))u),$$

as α and β range over R, the set of which we refer to as the spectrum of f. We consider functions with small spectra, with an interest in constructing codes with few weights.