Title: Codes in LRTJ-Spaces

Let $\mathbb{Z}_q$ be the ring of integers modulo $q$. Let $\text{Mat}_{m \times s}(\mathbb{Z}_q)$ be the set of all $m \times s$ matrices with entries from $\mathbb{Z}_q$. Then $\text{Mat}_{m \times s}(\mathbb{Z}_q)$ is a module over $\mathbb{Z}_q$. The LRTJ-metric [S. Jain, Algebra Colloquium, 2010] on $\text{Mat}_{m \times s}(\mathbb{Z}_q)$ is given as follows:

Let $Y \in \text{Mat}_{1 \times s}(\mathbb{Z}_q)$ with $Y = (y_1, y_2, \cdots, y_s)$. Define LRTJ-weight of $Y$ as

$$wt_\tau(Y) = \begin{cases} \max_{j=1}^s |y_j| + \max_{j=1}^s \{ j-1 \mid y_j \neq 0 \} & \text{if } Y \neq 0 \\ 0 & \text{if } Y = 0. \end{cases}$$

Then $0 \leq wt_\tau(Y) \leq \lceil q/2 \rceil + s - 1$. Extending the definition of LRTJ-weight to the class of all $m \times s$ matrices as

$$wt_\tau(A) = \sum_{i=1}^m wt_\tau(R_i)$$

where $A = \begin{bmatrix} R_1 \\ R_2 \\ \cdots \\ R_m \end{bmatrix} \in \text{Mat}_{m \times s}(\mathbb{Z}_q)$ and $R_i$ denotes the $i^{th}$ row of $A$. If we set $d(A, A') = wt_\tau(A - A') \forall A, A' \in \text{Mat}_{m \times s}(\mathbb{Z}_q)$, then $d$ determines a metric on $\text{Mat}_{m \times s}(\mathbb{Z}_q)$ known as LRTJ-metric (Lee-Rosenbloom-Tsfasman-Jain-metric). The space $\text{Mat}_{m \times s}(\mathbb{Z}_q)$ equipped with the LRTJ-metric is known as the LRTJ-space. An LRTJ-metric array code is a subspace of $\text{Mat}_{m \times s}(\mathbb{Z}_q)$.

In [2], Jain introduced this new metric viz. LRTJ-metric on the space $\text{Mat}_{m \times s}(\mathbb{Z}_q)$, the module space of all $m \times s$ matrices with entries from the finite ring $\mathbb{Z}_q(q \geq 2)$ generalizing the classical one dimensional Lee metric [7] and the two-dimensional RT-metric [8] which further appeared in [1].
In this talk, we discuss linear codes in LRTJ spaces [2] and obtain various bounds on the parameters of array codes in LRTJ-spaces for the correction of random array errors and usual and CT-burst array errors [2,3,4,6].

We also introduce the complete weight enumerator for codes in LRTJ-spaces and obtain a MacWilliams type identity [5] for the complete weight enumerator of the dual code of an array code in LRTJ-spaces.

References


