BULLETIN OF THE ICA
Article in press.

Skirting the n-tuples

Sam Adriaensen, Ferdinand Ihringer, William J. Martin, and Ralihe R. Villagrán

Abstract. Let $n \geq 2$ and $q \geq 2$ be given. The set $X = \{1, \ldots, q\}^n$ is a metric space of diameter n under the Hamming metric $d(\cdot,\cdot)$. We seek a smallest set $S \subseteq X$ that "skirts" every q-ary n-tuple in the sense that every $x \in X$ is at distance n from at least one element of S. Thus we aim to compute the total domination number $f(n, q)$ of the graph $G(n, q)$ with vertex set X and edge set $\{xy \,\|\, d(x, y) = n\}$. A probabilistic construction shows that $1 \leq f(n, q)/\big(q/(q-1)\big)^n \leq \lceil n \ln q \rceil$. We also provide some explicit constructions and introduce skirting arrays as a variant of covering arrays.

References

[1] N. Alon et al., *The hat guessing number of graphs*, J. Combin. Theory Ser. B **144** (2020), 119–149.

[2] C. J. Colbourn and J. H. Dinitz. *Handbook of Combinatorial Designs* (2nd ed.), Chapman & Hall/CRC, 2007.

[3] Colbourn tables of covering array numbers `https://github.com/ugroempi/CAs/blob/main/ColbournTables.md`

Key words and phrases: Hamming distance, covering array, total domination.
Mathematics Subject Classifications: 05B40, 05B15, 05B99, 05C69, 94B65.
Corresponding author: Sam Adriaensen <`Sam.Adriaensen@vub.be`>

Received: 1 February 2026
Accepted: 1 June 2026