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**Hamming distances from a function to all codewords of a generalized Reed-Muller code of order one.** (English) [Zbl 1386.94099](#)

*Appl. Algebra Eng. Commun. Comput.* 28, No. 5, 387-408 (2017).

Summary: For any finite field  $\mathbb{F}_q$  with  $q$  elements, we study the set  $\mathcal{F}_{(q,m)}$  of functions from  $\mathbb{F}_q^m$  into  $\mathbb{F}_q$  from geometric, analytic and algorithmic points of view. We determine a linear system of  $q^{m+1}$  equations and  $q^{m+1}$  unknowns, which has for unique solution the Hamming distances of a function in  $\mathcal{F}_{(q,m)}$  to all the affine functions. Moreover, we introduce a Fourier-like transform which allows us to compute all these distances at a cost  $O(mq^m)$  and which would be useful for further problems.

**MSC:**

[94B05](#) Linear codes, general

[11T71](#) Algebraic coding theory; cryptography (number-theoretic aspects)

**Keywords:**

Reed-Muller code; Hamming distance; arrangement of hyperplanes

**Full Text:** [DOI](#) [arXiv](#)

**References:**

- [1] Ashikhmin, A; Litsyn, S, Fast decoding of non-binary first order Reed-muller codes, *AAECC*, 7, 299-308, (1996) · [Zbl 0858.94027](#)
- [2] Colbourn, C., Dinitz, H. (eds.): *Handbook of Combinatorial Designs. Discrete Mathematics and its Applications*, 2nd edn. Chapman and Hall/CRC, Boca Raton (2007) · [Zbl 1101.05001](#)
- [3] Lachaud, G; Wolfmann, J, The weights of the orthogonals of the extended quadratic binary Goppa codes, *IEEE Tans. Inf. Theory*, 36, 686-692, (1990) · [Zbl 0703.94011](#)
- [4] Langevin, P.: *Rayon de Recouvrement des Codes de Reed-Muller Affines*. Ph.D. Thesis, Université de Limoges (1992)
- [5] Langevin, P.: *On the Orphans and Covering Radius of the Reed-Muller Codes*. *Lecture Notes in Computer Sciences*, vol. 539. Springer, Berlin (1991) · [Zbl 0767.94008](#)
- [6] Leducq, E, On the covering radius of first order generalized Reed-muller codes, *IEEE Trans. Inf. Theory*, 59, 1590-1596, (2013) · [Zbl 1364.94678](#)
- [7] Mc Eliece, RJ, Quadratic forms over finite fields and second order Reed-muller codes, *JPL Sp. Pograms Summ.*, III, 37-58, (1969)
- [8] Rolland, R.: *Fonction maximale non linéaires sur un corps fini*. Technical Report 25, Institut de Mathématiques de Luminy (2000)

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