COLOQUIO ΠRØBEMOΣ

Institut de Matemàtiques i Aplicacions de Castelló
UNIVERSITAT JAUME•I

Seminario a cargo de Marita Ferrer

Teorema de MacWilliams para códigos de bloque.

ABSTRACT: Let F be a finite field. Two linear codes C_1 and C_2 over F of length n are *equivalent* if there is a monomial transformation H of F^n such that $H(C_1) = (C_2)$. Here, a monomial transformation is a linear isomorphism H of the form $H(a_1, \dots, a_n) = \left(a_{\sigma(1)} w_1, \dots, a_{\sigma(n)} w_n\right)$, $(a_1, \dots, a_n) \in F^n$, where σ is a permutation of $\{1,2, \dots, n\}$ and $(w_1, \dots, w_n) \in (F \backslash \{0\})^n$. The Hamming weight $wt(x)$ of a vector $x \in F^n$ is defined as the number of coordinates that are different from zero. MacWilliams classical result establishes the relation between Hamming isometries and equivalent codes.

Theorem (MacWilliams): Two linear codes $C_1$and C_2 of dimension k in F^n are equivalent if and only if there exists an abstract F-linear isomorphism $f: C_1 \to C_2$ which preserves weights $wt\left(f(x)\right) = wt(x)$, for all $x \in C_1$.

Hence, two block codes are *isometric* if and only if they are monomially equivalent. More precisely, weight-preserving isomorphisms between codes are given by a permutation and rescaling of the coordinates. The fundamental result has been extended in different directions by many workers. In particular Heide Gluesing-Luerssen has established a variant of MacWilliams theorem for 1-dimensional convolutional codes and the isometries defined between them that respect the module structure of the codes. It remains open the representation of general F-isometries defined between convolutional codes.

A direct and concise proof of this classical result will be given in this talk.

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Lugar: **IMAC** **(***Seminario TI1329SD),* ESTCE. Universitat Jaume I de Castelló

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