

Zeitschrift: L'Enseignement Mathématique
Herausgeber: Commission Internationale de l'Enseignement Mathématique
Band: 40 (1994)
Heft: 1-2: L'ENSEIGNEMENT MATHÉMATIQUE

Artikel: ENUMERATIVE COMBINATORICS AND CODING THEORY
Autor: Eliahou, Shalom

Kurzfassung

DOI: <https://doi.org/10.5169/seals-61109>

Nutzungsbedingungen

Die ETH-Bibliothek ist die Anbieterin der digitalisierten Zeitschriften auf E-Periodica. Sie besitzt keine Urheberrechte an den Zeitschriften und ist nicht verantwortlich für deren Inhalte. Die Rechte liegen in der Regel bei den Herausgebern beziehungsweise den externen Rechteinhabern. Das Veröffentlichen von Bildern in Print- und Online-Publikationen sowie auf Social Media-Kanälen oder Webseiten ist nur mit vorheriger Genehmigung der Rechteinhaber erlaubt. [Mehr erfahren](#)

Conditions d'utilisation

L'ETH Library est le fournisseur des revues numérisées. Elle ne détient aucun droit d'auteur sur les revues et n'est pas responsable de leur contenu. En règle générale, les droits sont détenus par les éditeurs ou les détenteurs de droits externes. La reproduction d'images dans des publications imprimées ou en ligne ainsi que sur des canaux de médias sociaux ou des sites web n'est autorisée qu'avec l'accord préalable des détenteurs des droits. [En savoir plus](#)

Terms of use

The ETH Library is the provider of the digitised journals. It does not own any copyrights to the journals and is not responsible for their content. The rights usually lie with the publishers or the external rights holders. Publishing images in print and online publications, as well as on social media channels or websites, is only permitted with the prior consent of the rights holders. [Find out more](#)

Download PDF: 27.04.2026

ETH-Bibliothek Zürich, E-Periodica, <https://www.e-periodica.ch>

ENUMERATIVE COMBINATORICS
AND CODING THEORY

by Shalom ELIAHOU¹⁾

ABSTRACT. Let f be a polynomial in n variables with non-negative integral coefficients. The enumeration of the values assumed by f on $\{1, -1\}^n$ is shown to be equivalent to the enumeration of the weights in some associated binary linear code L_f . We use this correspondence, together with the MacWilliams identity, to enumerate (1) Hadamard matrices of some fixed order, and (2) the proper 4-colorings of a graph, in terms of the weight distribution of suitable binary codes. Similar formulas could be obtained for other combinatorial objects.²⁾

Let f be a polynomial in n variables with non-negative integral coefficients. We will address here the following

PROBLEM. Is there a point $p \in \{1, -1\}^n$ such that $f(p) = 0$? How many such binary zeros does f admit? More generally, what can be said about the *value enumerator* of f , which we define as

$$V_f(T) = \sum_{p \in \{\pm 1\}^n} T^{f(p)} \in \mathbf{N}[T, T^{-1}] ?$$

(Note that the coefficient of T^v in $V_f(T)$ is the number of binary points p such that $f(p) = v$, for $v \in \mathbf{Z}$.) Many classical combinatorial problems can be expressed in the above terms, for a suitable polynomial f .

In order to discuss these problems, we associate with f a binary linear code L_f , in such a way that the weight enumerator of L_f and the value enumerator of f faithfully reflect each other. We then invoke the MacWilliams identity from coding theory, to obtain formulas for the number of binary zeros

¹⁾ The author gratefully acknowledges support from the Fonds National Suisse de la Recherche Scientifique during part of the preparation of this paper.

²⁾ MR classification primary 05A15, secondary 94B05, 05B20, 05C15.