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## Abstracts

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### ON SOME GENERALIZATIONS OF A CLASS OF DISCRETE FUNCTIONS

Dimitar Kovachev

*e-mail:* dkovach@swu.bg

*ACM Computing Classification System (1998):* G.2.0.

*Key words:*  $k$ -valued logic,  $H$ -function, subfunction, range, spectrum, Latin hypercubes and hyperparallelepipeds.

**Abstract.** In this paper we examine discrete functions that depend on their variables in a particular way, namely the  $H$ -functions. The results obtained in this work make the “construction” of these functions possible.  $H$ -functions are generalized, as well as their matrix representation by Latin hypercubes.

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### PARALLEL CLASS INTERSECTION MATRICES OF ORTHOGONAL RESOLUTIONS\*

Stela Zhelezova

*e-mail:* stela@math.bas.bg

*ACM Computing Classification System (1998):* G.2.1.

*Key words:* Classification, resolvable design, orthogonal resolution.

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Part of the results were announced at the Fifth International Workshop on Optimal Codes and Related Topics (OCRT), White Lagoon, June 2007, Bulgaria.

**Abstract.** Parallel class intersection matrices (PCIMs) have been defined and used in [6], [14], [15] for the classification of resolvable designs with several parameter sets. Resolutions which have orthogonal resolutions (RORs) have been classified in [19] for designs with some small parameters. The present paper deals with the additional restrictions that the existence of an orthogonal mate might impose on the PCIMs of a resolution, and with the effect of both PCIMs usage and the methods for RORs construction described in [19] and [20]. It is shown in several examples how consideration of PCIMs can result in constructing only of solutions which can have orthogonal mates, and thus substantially improve the computation time. There are parameters for which PCIMs make the classification of RORs possible, and also cases when PCIMs directly prove the nonexistence of doubly resolvable designs with certain parameters.

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# NESSARY AND SUFFICIENT CONDITIONS FOR THE EXTENDABILITY OF TERNARY LINEAR CODES

Kei Okamoto

*e-mail:* [kk20@hotmail.co.jp](mailto:kk20@hotmail.co.jp)

*ACM Computing Classification System (1998):* E.4.

*Key words:* Ternary linear codes, extensions, diversity, projective spaces.

**Abstract.** We give the necessary and sufficient conditions for the extendability of ternary linear codes of dimension  $k \geq 5$  with minimum distance  $d \equiv 1$  or  $2 \pmod{3}$  from a geometrical point of view.

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# CONSTRUCTING A CANONICAL FORM OF A MATRIX IN SEVERAL PROBLEMS ABOUT COMBINATORIAL DESIGNS\*

Zlatka Mateva

*e-mail:* [ziz@abv.bg](mailto:ziz@abv.bg)

*ACM Computing Classification System (1998):* F.2.1, G.2.2.

*Key words:* Algorithm, automorphism, incidence matrix, orbit matrix, group action, canonical form, BIBD.

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**Abstract.** The author developed computer programs needed for the classification of designs with certain automorphisms by the local approach method. All these programs use canonicity test or/and construction of canonical form of an integer matrix. Their efficiency substantially influences the speed of the whole computation. The present paper deals with the implemented canonicity algorithm. It is based on ideas used by McKay, Meringer, Kaski and Bouyukliev, but while their algorithms are for the equivalence test, the canonicity test or finding canonical representative of only one type of combinatorial object (graph, code, design, binary matrix, etc.), the algorithm presented in this paper is meant to work fast on all types of integer matrices used for the classification of designs with predefined automorphisms. This is achieved through the suitable *spectrum* invariant, and the way it is used to cut off some branches of the search tree.

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# CONCEPTUAL INFORMATION COMPRESSION AND EFFICIENT SEARCH

Galia Angelova, Stoyan Mihov

*e-mails:* [galia@lml.bas.bg](mailto:galia@lml.bas.bg), [stoyan@lml.bas.bg](mailto:stoyan@lml.bas.bg)

*ACM Computing Classification System (1998):* E.4, F.1.1, G.2.3, G.4, I.2.4.

*Key words:* data compaction and compression, finite automata, applications, efficiency, semantic networks.

**Abstract.** This paper introduces an encoding of knowledge representation statements as regular languages and proposes a two-phase approach to processing of explicitly declared conceptual information. The idea is presented for the simple conceptual graphs where conceptual pattern search is implemented by the so called projection operation. Projection calculations are organised into off-line preprocessing and run-time computations. This enables fast run-time treatment of NP-complete problems, given that the intermediate results of the off-line phase are kept in suitable data structures. The experiments with randomly-generated, middle-size knowledge bases support the claim that the suggested approach radically improves the run-time conceptual pattern search.

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# A SEMANTIC-ORIENTED ARCHITECTURE OF A FUNCTIONAL MODULE FOR PERSONALIZED AND ADAPTIVE ACCESS TO THE KNOWLEDGE IN A MULTIMEDIA DIGITAL LIBRARY\*

Desislava Paneva-Marinova<sup>†</sup>

*e-mail:* [dessi@cc.bas.bg](mailto:dessi@cc.bas.bg)

*ACM Computing Classification System (1998):* H.3.7, I.2.4.

*Key words:* personalization, adaptive access, service-based architecture, multimedia digital libraries.

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<sup>†</sup>This article presents the principal results of the doctoral thesis “Semantic-oriented Architecture and Models for Personalized and Adaptive Access to the Knowledge in Multimedia Digital Library” by Desislava Ivanova Paneva-Marinova (Institute of Mathematics and Informatics), successfully defended before the Specialised Academic Council for Informatics and Mathematical Modelling on 27 October, 2008.

**Abstract.** This paper presents dissertation work on semantic-oriented architectures and models for personalized and adaptive access to the knowledge in a multimedia digital library. The work was presented on October 27, 2008 before the Specialized Academic Council in Informatics and Mathematical Modelling at the Higher Attestation Commission. As a result of the work there appeared a functional module providing customized user access to the library content flow. The module used an IEEE PAPI and IMS LIP-oriented ontological user model. The main services provide customized user access, browsing, searching, and grouping of digitised objects and collections, user profile management, tracking the user’s behaviour, etc. The services require and trace out data about the preliminary level of the users’ knowledge in the domain covered by the digital library, their object observation style, cognitive goals and interests, preferences about the objects/collections presentation and grouping, physical limitations, used knowledge delivery channels (Web, mobile phone), etc. Then they transform the available digitised objects into a new personalized form, and finally deliver them to the user. The module uses special usage scenarios/instructions defining a wide range of service actions dependent on the user’s background, events, informal learning situations, knowledge delivery channels, etc.