

# Serdica Journal of Computing

Volume 2, Number 2, 2008

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## Abstracts

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### ON THE WEIGHT DISTRIBUTION OF THE COSET LEADERS OF CONSTACYCLIC CODES

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*ACM Computing Classification System (1998): G.2.3.*  
*Key words:* covering radius, constacyclic codes, coset leaders.

Abstract. Constacyclic codes with one and the same generator polynomial and distinct length are considered. We give a generalization of the previous result of the first author [4] for constacyclic codes. Suitable maps between vector spaces determined by the lengths of the codes are applied. It is proven that the weight distributions of the coset leaders don't depend on the word length, but on generator polynomials only. In particular, we prove that every constacyclic code has the same weight distribution of the coset leaders as a suitable cyclic code.

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## ANALYSIS OF THE DISTRIBUTIONS OF COLOR CHARACTERISTICS IN ART PAINTING IMAGES

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*ACM Computing Classification System (1998):* H.5.1, H.3.1, H.3.3.

*Key words:* Classification, Color, Image, Information retrieval, Multimedia.

**Abstract.** In this paper we study some of the characteristics of the art painting image color semantics. We analyze the color features of different artists and art movements. The analysis includes exploration of hue, saturation and luminance. We also use quartile's analysis to obtain the distribution of the dispersion of defined groups of paintings and measure the degree of purity for these groups. A special software system "Art Painting Image Color Semantics" (APICSS) for image analysis and retrieval was created. The obtained result can be used for automatic classification of art paintings in image retrieval systems, where the indexing is based on color characteristics.

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## EFFICIENT COMPUTING OF SOME VECTOR OPERATIONS OVER GF(3) AND GF(4)

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*ACM Computing Classification System (1998):* F.2.1, G.4, I.1.1.

*Key words:* Finite field, Bit-wise representation, Addition of vectors, Multiplication of a vector by a scalar.

**Abstract.** The problem of efficient computing of the affine vector operations (addition of two vectors and multiplication of a vector by a scalar over GF(q)), and also the weight of a given vector, is important for many problems in coding theory, cryptography, VLSI technology etc. In this paper we propose a new way of representing vectors over GF(3) and GF(4) and we describe an efficient performance of these affine operations. Computing weights of binary vectors is also discussed.

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## FLQ, THE FASTEST QUADRATIC COMPLEXITY BOUND ON THE VALUES OF POSITIVE ROOTS OF POLYNOMIALS

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*ACM Computing Classification System (1998):* G.1.5, F.2.1, I.1.2.

*Key words:* Vincent's theorem, real root isolation methods, linear and quadratic complexity bounds on the values of the positive roots.

**Abstract.** In this paper we present FLQ, a quadratic complexity bound on the values of the positive roots of polynomials. This bound is an extension of FirstLambda, the corresponding linear complexity bound and, consequently, it is derived from Theorem 3 below. We have implemented FLQ in the Vincent-Akritas-Strzeboński Continued Fractions method (VAS-CF) for the isolation of real roots of polynomials and compared its behavior with that of the theoretically proven best bound, LMQ. Experimental results indicate that whereas FLQ runs on average faster (or quite faster) than LMQ, nonetheless the quality of

the bounds computed by both is about the same; moreover, it was revealed that when VAS-CF is run on our benchmark polynomials using FLQ, LMQ and min(FLQ;LMQ) all three versions run equally well and, hence, it is inconclusive which one should be used in the VAS-CF method.

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## IMPROVING THE WATERMARKING PROCESS WITH USAGE OF BLOCK ERROR-CORRECTING CODES

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*ACM Computing Classification System (1998): D.1.7 - E.4 - I.4.0.*

*Key words:* Watermarking, error-correcting codes, Reed-Solomon codes, software for watermarking.

**Abstract.** The emergence of digital imaging and of digital networks has made duplication of original artwork easier. Watermarking techniques, also referred to as digital signature, sign images by introducing changes that are imperceptible to the human eye but easily recoverable by a computer program. Usage of error correcting codes is one of the good choices in order to correct possible errors when extracting the signature. In this paper, we present a scheme of error correction based on a combination of Reed-Solomon codes and another optimal linear code as inner code. We have investigated the strength of the noise that this scheme is steady to for a fixed capacity of the image and various lengths of the signature. Finally, we compare our results with other error correcting techniques that are used in watermarking. We have also created a computer program for image watermarking that uses the newly presented scheme for error correction.

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## ON THE GENERATION OF HERONIAN TRIANGLES

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

*Key words:* Heron triangles, system of Diophantine equations, triangles with rational area, perfect pyramids.

**Abstract.** We describe several algorithms for the generation of integer Heronian triangles with diameter at most  $n$ . Two of them have running time  $O(n^{2+\epsilon})$ . We enumerate all integer Heronian triangles for  $n \leq 600000$  and apply the complete list on some related problems.

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## THE NONEXISTENCE OF SOME GRIESMER ARCS IN PG(4; 5)

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*ACM Computing Classification System (1998): E.4, G.2.1.*

*Key words:* minihypers, linear codes over finite fields, Griesmer bound, finite projective geometry.

**Abstract.** In this paper, we prove the nonexistence of arcs with parameters  $(232; 48)$  and  $(233; 48)$  in PG(4; 5). This rules out the existence of linear codes with parameters  $[232; 5; 184]$  and  $[233; 5; 185]$  over the field with five elements and improves two instances in the recent tables by Maruta, Shinohara and Kikui of optimal codes of dimension 5 over  $F_5$ .