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Abstracts

THREE NEW METHODS FOR COMPUTING SUBRESULTANT POLYNOMIAL REMAINDER SEQUENCES (PRS’S)∗

Alkiviadis G. Akritas

e-mail: akritas@uth.gr


Key words: pseudo remainders, subresultant prs’s, Sylvester’s matrices.

Abstract. Given the polynomials $f, g \in \mathbb{Z}[x]$ of degrees $n, m$, respectively, with $n > m$, three new, and easy to understand methods — along with the more efficient variants of the last two of them — are presented for the computation of their subresultant polynomial remainder sequence (prs).

All three methods evaluate a single determinant (subresultant) of an appropriate sub-matrix of $\text{svylerter}1$, Sylvester’s widely known and used matrix of dimension $(m+n) \times (m+n)$, in order to compute the correct sign of each polynomial in the sequence and — except for the second method — to force its coefficients to become subresultants.

Of interest is the fact that only the first method uses pseudo remainders. The second method uses regular remainders and performs operations in $\mathbb{Q}[x]$, whereas the third one triangularizes $\text{svylerter}2$, Sylvester’s little known and hardly ever used matrix of $1853$ of dimension $2n \times 2n$.

All methods mentioned in this paper (along with their supporting functions) have been implemented in Sympy and can be downloaded from the link http://inf-server.inf.uth.gr/~akritas/publications/subresultants.py.

∗ To the memory of Anna Johnson Pell∗∗ and R. L. Gordon, for their inspiring Theorem of 1917!

∗∗ See the link http://en.wikipedia.org/wiki/Anna_Johnson_Pell_Wheeler for her biography.

ON THE CRITICAL POINTS OF KYURKCHIEV’S METHOD FOR SOLVING ALGEBRAIC EQUATIONS∗

Nikola Valchanov, Angel Golev, Anton Iliev

e-mail: nvalchanov@gmail.com

angel@kodar.net

aii@uni-plovdiv.bg, anton.iliev@gmail.com


Key words: polynomial roots, Kyurkchiev’s method, divergent sets.

Abstract. This paper gives sufficient conditions for $k$th approximations of the zeros of polynomial $f(x)$ under which Kyurkchiev’s method fails on the next step. The research is linked with an attack on the global convergence...
hypothesis of this commonly used in practice method (as correlate hypothesis for Weierstrass–Dochev’s method). Graphical examples are presented.

* This paper is dedicated to Prof. Nikolay Kyurkchiev on the occasion of his 70th anniversary.

MODEL MINING AND EFFICIENT VERIFICATION OF SOFTWARE PRODUCT LINES
Siavash Soleimanifard, Dilian Gurov, Ina Schaefer, Bjarte M. Østvold, Minko Markov
e-mail: {siavashs,dilian}@csc.kth.se
    i.schaefer@tu-braunschweig.de
    bjarte@nr.no
    minkom@fmi.uni-sofia.bg

Key words: product families, compositional verification, model mining, variability models, model checking, maximal models.

Abstract. Software product line modeling aims at capturing a set of software products in an economic yet meaningful way. We introduce a class of variability models that capture the sharing between the software artifacts forming the products of a software product line (SPL) in a hierarchical fashion, in terms of commonalities and orthogonalities. Such models are useful when analyzing and verifying all products of an SPL, since they provide a scheme for divide-and-conquer-style decomposition of the analysis or verification problem at hand. We define an abstract class of SPLs for which variability models can be constructed that are optimal w.r.t. the chosen representation of sharing. We show how the constructed models can be fed into a previously developed algorithmic technique for compositional verification of control-flow temporal safety properties, so that the properties to be verified are iteratively decomposed into simpler ones over orthogonal parts of the SPL, and are not re-verified over the shared parts. We provide tool support for our technique, and evaluate our tool on a small but realistic SPL of cash desks.

CLASSIFICATION OF MAXIMAL OPTICAL ORTHOGONAL CODES OF WEIGHT 3 AND SMALL LENGTHS*
Tsonka Baicheva, Svetlana Topalova
e-mail: {tsonka,svetlana}@math.bas.bg

Key words: optical orthogonal codes, cyclic Steiner triple systems, binary cyclically permutable constant weight codes, code division multiple access system.

Abstract. We classify up to multiplier equivalence maximal \((v, 3, 1)\) optical orthogonal codes (OOCs) with \(v \leq 61\) and maximal \((v, 3, 2, 1)\) OOCs with \(v \leq 99\). There is a one-to-one correspondence between maximal \((v, 3, 1)\) OOCs, maximal cyclic binary constant weight codes of weight 3 and minimum distance 4, \((v, 3, [(v - 1)/6]))\) difference packings, and maximal \((v, 3, 1)\) binary cyclically permutable constant weight codes. Therefore the classification of \((v, 3, 1)\) OOCs holds for them too. Some of the classified \((v, 3, 1)\) OOCs are perfect and they are equivalent to cyclic Steiner triple systems of order \(v\) and \((v, 3, 1)\) cyclic difference families.

* Dedicated to the memory of the late professor Stefan Dodunekov on the occasion of his 70th anniversary.

ON THE APPROXIMATION OF THE GENERALIZED CUT FUNCTION OF DEGREE \(P + 1\) BY SMOOTH SIGMOID FUNCTIONS
Nikolay Kyurkchiev, Svetoslav Markov
e-mail: nkyurk@math.bas.bg
    smarkov@bio.bas.bg

Abstract. We introduce a modification of the familiar cut function by replacing the linear part in its definition by a polynomial of degree \( p + 1 \) obtaining thus a sigmoid function called \textit{generalized cut function of degree} \( p + 1 \) \((GCFP)\). We then study the uniform approximation of the \((GCFP)\) by smooth sigmoid functions such as the logistic and the shifted logistic functions. The limiting case of the interval-valued Heaviside step function is also discussed which imposes the use of Hausdorff metric. Numerical examples are presented using \textit{CAS MATHEMATICA}.