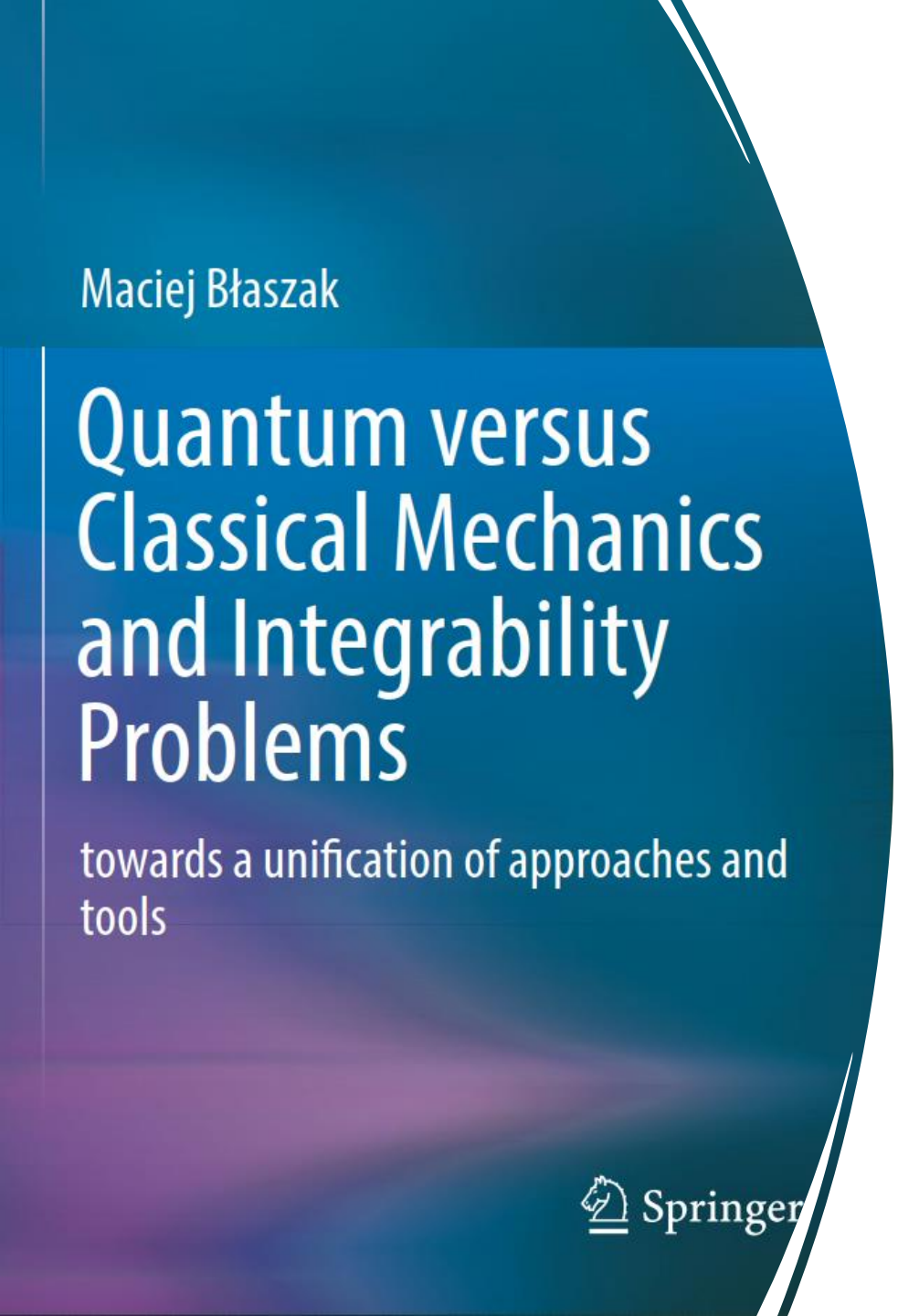

Prof. Maciej Błaszak

- teoria całkowalnych nieliniowych układów dynamicznych
- unifikacja hamiltonowskiej teorii mechaniki klasycznej i kwantowej, wykorzystująca tzw. kwantyzację deformacyjną
- jawnie zależne od czasu równania typu Painlevé, transcendentalne funkcje Painlevé

Prof. UAM Błażej Szablikowski

Unifikacja konstrukcji nieskończenie-wymiarowych rozmaitości Frobeniusa powiązanych z nieskończenie-polowymi całkowalnymi hierarchiami układów hydrodynamicznych typu KP i Tody

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Bi-Hamiltonian Systems in (2+1) and Higher Dimensions Defined by Novikov Algebras

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Abstract. The results from the article [Strachan I.A.B., Szablikowski B.M., *Stud. Appl. Math.* **133** (2014), 84–117] are extended over consideration of central extensions allowing the introducing of additional independent variables. Algebraic conditions associated to the first-order central extension with respect to additional independent variables are derived. As result (2+1)- and, in principle, higher-dimensional multicomponent bi-Hamiltonian systems are constructed. Necessary classification of the central extensions for low-dimensional Novikov algebras is performed and the theory is illustrated by significant (2+1)- and (3+1)-dimensional examples.

Key words: Novikov algebras; (2+1)- and (3+1)-dimensional integrable systems; bi-Hamiltonian structures; central extensions

2010 Mathematics Subject Classification: 37K10; 17B80; 37K30

KdV stationary systems and their Stäckel representations

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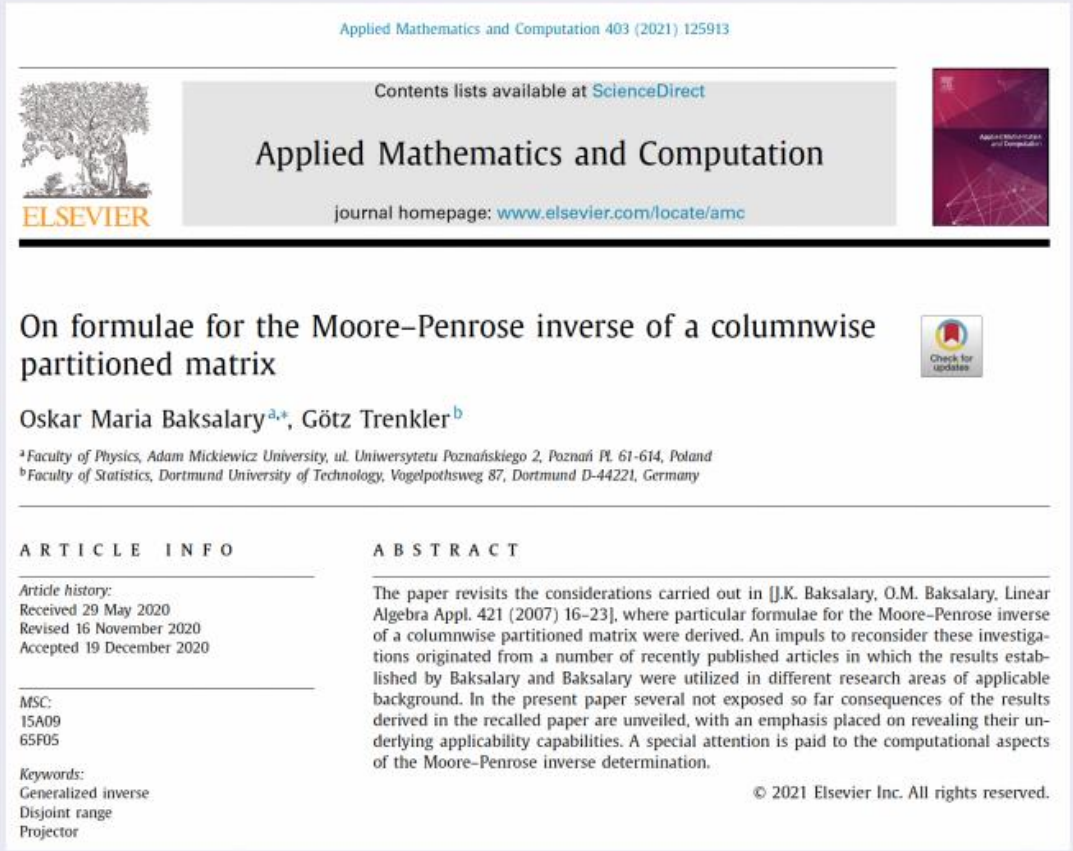
Abstract

The notion of KdV stationary systems is introduced. Taking advantage of the Lax formalism, it is proved that these systems have two different representations by means of the particular Stäckel systems of Benenti type. The explicit transformation between jet coordinates and separation variables for arbitrary number of degrees of freedom is presented. Besides, the Miura map between both representations of the KdV stationary systems is derived.

Prof. UAM Oskar Maria Baksalary

Rozwijanie narzędzi matematycznych (wywodzących się np. z analizy macierzowej) znajdujących zastosowanie w rozmaitych obszarach badań naukowych, m.in. w fizyce, statystyce, metodach numerycznych



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On formulae for the Moore–Penrose inverse of a columnwise partitioned matrix

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ABSTRACT

The paper revisits the considerations carried out in [J.K. Baksalary, O.M. Baksalary, Linear Algebra Appl. 421 (2007) 16–23], where particular formulae for the Moore–Penrose inverse of a columnwise partitioned matrix were derived. An impuls to reconsider these investigations originated from a number of recently published articles in which the results established by Baksalary and Baksalary were utilized in different research areas of applicable background. In the present paper several not exposed so far consequences of the results derived in the recalled paper are unveiled, with an emphasis placed on revealing their underlying applicability capabilities. A special attention is paid to the computational aspects of the Moore–Penrose inverse determination.

Prof. UAM Oskar Maria Baksalary

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REGULAR ARTICLE

An alternative look at the linear regression model

Oskar Maria Baksalary[1] · Götz Trenkler[2]

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Abstract
An alternative look at the linear regression model is taken by proposing an original treatment of a full column rank model (design) matrix. In such a situation, the Moore–Penrose inverse of the matrix can be obtained by utilizing a particular formula which is applicable solely when a matrix to be inverted can be columnwise partitioned into two matrices of disjoint ranges. It turns out that this approach, besides simplifying derivations, provides a novel insight into some of the notions involved in the model and reduces computational costs needed to obtain sought estimators. The paper contains also a numerical example based on astronomical observations of the localization of Polaris, demonstrating usefulness of the proposed approach.

Keywords Least squares method · Experimental data processing · Estimation theory · Moore–Penrose inverse · Columnwise partitioned matrix · Astronomical observations

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Regular Article

The Moore–Penrose inverse: a hundred years on a frontline of physics research

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Abstract The Moore–Penrose inverse celebrated its 100th birthday in 2020, as the notion standing behind the term was first defined by Eliakim Hastings Moore in 1920 (Bull Am Math Soc 26:394–395, 1920). Its rediscovery by Sir Roger Penrose in 1955 (Proc Camb Philos Soc 51:406–413, 1955) can be considered as a caesura, after which the inverse attracted the attention it deserves and has henceforth been exploited in various research branches of applied origin. The paper contemplates the role, which the Moore–Penrose inverse plays in research within physics and related areas at present. An overview of the up-to-date literature leads to the conclusion that the inverse "grows" along with the development of physics and permanently (maybe even more demonstrably now than ever before) serves as a powerful and versatile tool to cope with the current research problems.