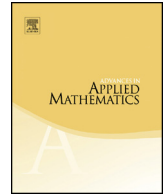




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Preface

Special issue on computational aspects of differential/difference algebra and integral operators



This special issue on *Computational Aspects of Differential/Difference Algebra and Integral Operators* arose from two special sessions, “Computational Differential and Difference Algebra” and “Algebraic and Algorithmic Aspects of Differential and Integral Operators”, of the Applications of Computer Algebra conference (ACA), which took place at Fordham University in July 9–12, 2014. In those two special sessions, altogether 33 presentations were given, which was a record high for the field at that annual conference. Also the breadth of research directions exhibited by the presenters was unprecedented: novel and deep theoretical methods (resulting in new and more efficient algorithms), as well as concrete applied examples and software implementation. However, submissions to this special issue were not restricted to the presenters or participants of the two special sessions, and a wide research community announcement was made. The topics of the special issue include but are not limited to the topics of the special sessions.

The ACA track on *Computational Differential and Difference Algebra* was inaugurated in 2014, offering again a large session at the ACA 2015 in Kalamata, Greece. The *Algebraic and Algorithmic Aspects of Differential and Integral Operators Session* (AADIOS) was initiated by G. Regensburger and M. Rosenkranz at the ACA 2008 held in Hagenberg, Austria, running annually since then (intermediate meetings in Montréal 2009, Vlori 2010, Houston 2011, Sofia 2012, Malaga 2013). Since 2012 the AADIOS is co-organized with M. Barkatou and T. Cluzeau. Two proceedings volumes have been edited from the fruits of these meetings: an MCS Double Special Issue (Vol. 4, Nos. 2–3, 2010), based on the 2008–10 meetings, and the Springer LNCS volume 8372, based on the 2011–12 sessions.

Let us provide a *short overview of the contributions*. The paper by S. Rueda establishes a bridge between the differential elimination problem for systems of ordinary differential polynomials and the use of sparse algebraic resultants. In “Differential (Lie) algebras from a functorial point of view”, L. Poinset employs tools from universal algebra to construct the differential analog of the universal enveloping algebra for a given differ-

ential Lie algebra. W. Li and Y. Li discuss new techniques in differential elimination, including differential Chow forms. In the paper by V. Gerdt and D. Robertz, differential Thomas decomposition is used for deriving all algebraically independent constraints on the initial data of mechanical and field-theoretical models with singular Lagrangians. The article by L. Guo, W. Keigher and S. Zhang investigates the relation between differential and Rota–Baxter algebras via the First Fundamental Theorem of Calculus from a categorical point of view. The paper “Dimension polynomials of difference local algebras” by A. Levin shows how the theory of dimension polynomials for difference field extensions can be extended to larger classes of difference rings. In the paper by L. D’Alfonso, G. Jeronimo and P. Solernó, an effective integrability criterion for differential-algebraic Pfaffian systems is obtained and applied to design a decision method of consistency for such systems. The article by A. Magid studies injective modules and homology for differential modules over a commutative differential algebra. J. Freitag and A. Minchenko study applications of model theory to differential algebraic groups, which serve as a tool for understanding differential algebraic relations among solutions of differential and difference equations.

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