

Gröbner-type Bases with Respect to the Effective Order and Bivariate Dimension Polynomials of Difference Modules

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We introduce Gröbner-type bases in free difference modules that are associated with a reduction respecting the effective order of module elements. We prove some properties of such bases and present a Buchberger-type algorithm for their computation. The obtained results allows us to give a method of computation of a bivariate dimension polynomial of a finitely generated difference module. (The existence theorem for such a dimension polynomial was proved in [1], but that paper does not give a method of its computation.) We consider invariants of the bivariate difference dimension polynomials and show how they can be applied to the isomorphism problem for difference modules and to the equivalence problem for systems of algebraic difference equations. We also present a generalization of the results on multivariate difference dimension polynomials obtained in [2].

References

- [1] A. Levin. Reduction with Respect to the Effective Order and a New Type of Dimension Polynomials of Difference Modules. *Proceedings of the 2022 International Symposium on Symbolic and Algebraic Computation (ISSAC '22)*, ACM, New York, 55–62.
- [2] A. B. Levin. Computation of the Strength of Systems of Difference Equations via Generalized Gröbner Bases. *Gröbner Bases in Symbolic Analysis*, Walter de Gruyter, 2007, 43–73.