Generalized Gröbner Bases and Dimension Polynomials of D-modules

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We consider several term orderings in a finitely generated free module E over a Weyl algebra $A_n(K)$ that are associated with a partition of the basic set of variables of $A_n(K)$. Using these term orderings, we introduce a new type of reductions in the module E and Gröbner-type bases associated with these reductions. Properties of the introduced bases allow us to obtain a multivariate dimension polynomial of a finitely generated D-module, that is, a left $A_n(K)$-module. We present invariants of such dimension polynomials and prove an intersection property for multivariate filtrations in a certain class of D-modules. The obtained results generalize theorems on bivariate Bernstein-type dimension polynomials proved in [1] and reveal new characteristics of finitely generated D-modules.

References

[1] C. Dönch; A. Levin. Bivariate Dimension Polynomials and New Invariants of Finitely Generated D-Modules. *Int. J. Algebra Comput.*, 23: 1625–1651, 2013.