Symbolic Computation for Linear Boundary Problems

*Markus Rosenkranz** (RICAM, Austrian Acad. Sc.)*, *Georg Regensburger* (RICAM, Austrian Acad. Sc.)

We describe a symbolic computation approach to boundary problems for LODE, currently implemented in the Theorema system. We use an operator algebra described by noncommutative polynomials and Groebner bases; this provides a uniform language for stating boundary problems (differential and boundary operators) and solving them by their Green's operator (integral operators). We have also set up a multiplicative structure on boundary problems, with algorithms for composing and factoring boundary problems. The latter allows to decompose a higher-order boundary problem into lower-order factor problems.

[1] M. ROSENKRANZ, G. REGENSBURGER: Solving and factoring boundary problems for linear ordinary differential equations in differential algebras, *Journal of Symbolic Computation*, 43(2008), pp. 515–544.

[2] G. REGENSBURGER, M. ROSENKRANZ: An algebraic foundation for factoring linear boundary problems, *Annali di Matematica*, 188(2009), pp. 123–151.