

Rota’s Program on Algebraic Operators

Xing Gao¹, Li Guo², Huhu Zhang¹

[liguo@rutgers.edu]

¹School of Mathematics and Statistics, Lanzhou University, Lanzhou, Gansu 730000, P. R. China

²Department of Mathematics and Computer Science, Rutgers University, Newark, NJ 07102, United States

Linear operators satisfying various algebraic operator identities have appeared in mathematical research, including endomorphisms, derivations and Rota-Baxter operators. Many years ago, G.-C. Rota proposed a program to determine all such linear operators [1]. After an extended period of dormant, progress on this program picked up speed in recent years, thanks to perspectives from operated algebras, rewriting systems and Gröbner-Shirshov bases. These advances were achieved in a series of papers from special cases to more general situations [2,3,4]. These perspectives also indicate that Rota’s insight can be manifested very broadly, for other algebraic structures such as Lie algebras, and further in the context of operads. This talk presents motivation, early developments and recent advances on Rota’s program for linear operators on associative algebras and Lie algebras [5].

Keywords

Operator identity, Rewriting system, Gröbner-Shirshov basis

References

- [1] G.-C. ROTA, Baxter operators, an introduction, In *Gian-Carlo Rota on Combinatorics, Introductory papers and commentaries*, J. Kung (eds.), 504-512, Birkhäuser, Boston, 1995.
- [2] L. GUO, W. SIT AND R. ZHANG, Differential type operators and Gröbner-Shirshov bases, *J. Symbolic Comput.* **52**, 97–123 (2013).
- [3] X. GAO, L. GUO, W. SIT AND S. ZHENG, Rota-Baxter type operators, rewriting systems and Gröbner-Shirshov bases, *J. Symbolic Comput.*, accepted.
- [4] X. GAO AND L. GUO, Rota’s Classification Problem, rewriting systems and Gröbner-Shirshov bases, *J. Algebra* **470**, 219-253 (2017).
- [5] X. GAO, L. GUO AND H. ZHANG, On Rota’s classification problem for Lie algebras, in preparation.