

Abstract

The ordinary tensor product of Rota-Baxter operators is not stable and therefore does not provide a natural monoidal structure on the category of Rota-Baxter algebras. We resolve this obstruction by passing to augmented Rota-Baxter algebras and by introducing a triangular tensor product governed by the augmentation. This construction makes the category of augmented Rota-Baxter algebras into a monoidal category. We identify its comonoid objects with Rota-Baxter cocycle bialgebras, thereby giving a categorical explanation for the Hochschild 1-cocycle condition. As an application, we construct a canonical bialgebra structure on the free commutative Rota-Baxter algebra generated by a commutative bialgebra, prove its universal property as a free commutative Rota-Baxter cocycle bialgebra, and obtain a Hopf algebra in the connected filtered case. This talk is based on a joint work with Li Guo and Yunzhou Xie.