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New examples of Hopf algebras with nonzero integral

The Haar measure on a compact group induces a linear functional $\int$ on the Hopf algebra of its representative functions. The invariance property of the Haar measure reads as a condition on $\int$ that can be expressed in Hopf algebraic terms. Sweedler defined an algebraic notion of integral for Hopf algebras using this condition. Hopf algebras having a nonzero integral are also called co-Frobenius.

The quantized coordinate algebra $\mathcal{O}_q(G)$ of a simple algebraic group G is one of the most relevant examples of co-Frobenius Hopf algebras. When q is a root of unity, the usual coordinate algebra $\mathcal{O}(G)$ is a central Hopf subalgebra of $\mathcal{O}_q(G)$ and $\mathcal{O}_q(G)$ is finitely generated (and free) as a module over $\mathcal{O}(G)$. Moreover, $\mathcal{O}(G)$ coincides with the Hopf socle of $\mathcal{O}_q(G)$. Based on this example, Andruskiewitsch and Dăscălescu asked in [*Co-Frobenius Hopf algebras and the coradical filtration*. Math. Z. **243** (2003), 145-154] whether any co-Frobenius Hopf algebra is finitely generated as a module over its Hopf socle.

In this talk we will introduce a new family of co-Frobenius Hopf algebras that answers in the negative this question. The results that will be presented are part of a joint work with N. Andruskiewitsch (National University of Córdoba, Argentina) and P. Etingof (Massachusetts Institute of Technology, USA). Arxiv:1206.5934.