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TITLE: Invariants in a free linear category

ABSTRACT:

This work is joint with Eduardo Marcos.

Let k be a field with an homogeneous action of a finite group on a free k -algebra, that is on a tensor algebra. Kharchenko and Lane proved that the invariant subalgebra is always free. In this talk we consider a free k -category L and a finite group acting homogeneously, and we prove that the invariant category L^G is still a free category. Notice that the problem of describing invariants of an action of a group goes back to D. Hilbert and E. Noether. For commutative free algebras over a field of characteristic zero, the situation is different. A homogeneous action of a finite subgroup of $GL(d,k)$ provides again a commutative free algebra of invariants if and only if the group is generated by pseudo-reflections (G.C. Shephard and J.A. Todd, and C. Chevalley and J.P. Serre).

Our proof relies on a new result that we have obtained concerning a tensor product of a sequence of finite dimensional kG -modules : each invariant vector decomposes uniquely as a sum of tensors of irreducible invariant vectors of strict sub-sequences of modules.

In another direction we prove that in case the order of G is invertible, L^G is a cleaving subcategory of L , enabling to show that if L is of finite (resp. tame) representation type, so is L^G .

A Galois correspondence between subcategories containing L^G and subgroups of G is expected. In another direction, after the work of Ferreira, Murakami and Paques considering the action of a Hopf algebra on a free algebra, similar results are predicted for a Hopf algebra acting homogeneously on a free k -category.