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The Galois Group of the Category of Mixed Hodge-Tate Structures

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This talk is based on the joint work with Guangyu Zhu.

The category of rational mixed Hodge-Tate structures is canonically equivalent to the category of finite-dimensional graded comodules over a graded commutative Hopf algebra H over Q. The latter is the algebra of functions on the Galois group of the category.
Since the category has homological dimension 1, the Hopf algebra H is isomorphic to the commutative graded Hopf algebra given by the tensor algebra of the direct sum of over n>0 of C/Q(n), placed in the degree n, with the shuffle product.
However this isomorphism is not natural, e.g. does not work in families. We give a natural explicit construction of the Hopf algebra H.
Generalizing this, we define a Hopf dg-algebra, describing a dg-model of the derived category of variations of Hodge-Tate structures on a complex manifold X. Its cobar complex is a dg-model for the rational Deligne cohomology of X.
Here is an application. Periods of weight n variations of mixed Hodge-Tate structures are multivalued functions, e.g. the weight n polylogarithms. We define refined periods. They are single-valued, and take values in the tensor product of the multiplicative group of complex numbers and n-1 copies of the abelian group of complex numbers.
We also consider a p-adic variant of the construction which starts from Fontaine's crystalline / semi-stable period rings and produces graded / dg Hopf algebras, related to the p-adic Hodge theory.

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