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Crossed-products of Calabi–Yau algebras by finite groups

Calabi–Yau algebras were defined by Ginzburg as non-commutative analogues of coordinate rings of Calabi–Yau manifolds. In the representation theory of finite dimensional algebras, the Calabi–Yau (differential graded) algebras of dimension 3 are key ingredients to construct 2-Calabi–Yau categories (following the work of Amiot) which serve to categorify the cluster algebras defined by Fomin and Zelevinsky.

For example, $\mathbb{C}[X, Y, Z]$ is a Calabi–Yau algebra. So are the Weyl algebras, as proved by Berger.

When a finite group G acts on an algebra A, the crossed-product algebra $A \rtimes G$ is often considered as a nice (smooth) replacement of the algebra of invariants A^G, the latter being more difficult to handle. For example, if G is a finite subgroup of $\mathrm{SL}_3(\mathbb{C})$, then it acts on $\mathbb{C}[X, Y, Z]$. In this setting, Ginzburg proved that $\mathbb{C}[X, Y, Z] \rtimes G$ is Calabi–Yau.

In this talk we shall see to what extent this result still holds for the action of a finite group on a Calabi–Yau algebra. Some consequences in representation theory of finite dimensional algebras will be presented.