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Almost involutive Hopf algebras: are there additional symmetries in Hopf algebras besides the antipode?

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An involutory Hopf algebra is a Hopf algebra whose antipode squared equals the identity, $S^2 = \text{operatorname{id}}$.

The identity map is an automorphism of Hopf algebras, hence it is tempting to substitute $\text{operatorname{id}} \mapsto \sigma$ where σ is an arbitrary Hopf morphism and consider Hopf algebras whose antipode (that is an antimorphism of Hopf algebras) squared is the square of a Hopf automorphism, $\text{ant}^2 = \sigma^2$. A map such as σ if it exists, is called a companion morphism.

If

ant has finite order, so does σ . A morphism of a given mathematical structure that is of finite order may be interpreted as a symmetry of the structure.

Hence, the companion morphism can be interpreted as an additional symmetry of the structure of H . If the Hopf algebra H admits a companion morphism, we say that it is almost involutory (AI).

The purpose of this talk, is to define and consider the initial properties of almost involutory Hopf algebras. We prove that up to dimension 15 all Hopf algebras except a few types in dimensions eight and twelve are AI.

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