

Invariance of representation dimension under socle equivalence of selfinjective algebras

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Abstract

Holomological invariants are used to measure how far does an algebra, or a module, deviates from a situation considered to be ideal. From the point of view of representation theory, one of the most interesting is the representation dimension of an artin algebra introduced by Maurice Auslander in the early seventies and meant to measure de complexity of the morphisms in the module category.

Interest in this invariant was revived when Igusa and Todorov proved that algebras of representation dimension three have finite finitistic dimension. Iyama proved that the representation dimension of an artin algebra is always finite and Rouquier that there exist algebras of arbitrarily large representation dimension. One important question is to identify which algebraic procedures have representation dimension invariant. It is known that stable equivalences preserves the representation dimension, a result proved independently by Dugas and Gu. While derived equivalences does not, in general preserve representation dimension, this is the case for selfinjective algebras.

Our objective in this talk is to prove that the representation dimension is preserved under socle equivalence of selfinjective algebra. We recall that to finite dimensional algebras A and B over an arbitrary field K are called socle equivalence provided the quotients algebras $A/\text{soc } A$ and $B/\text{soc } B$ are isomorphic. Such equivalence plays a prominent rôle in the representation theory of selfinjective algebras. Frecuently, interesting selfinjective algebras are socle equivalent to others for which the representation and related invariants are well-understood. Our proof is constructive, given an Auslander generator for $\text{mod-}A$, we show how to construct one for $\text{mod-}B$.

In this talk we relate the representation dimension with the shape of Auslander-Reiten components. We obtain a local property to determine the representation dimension. Finally, we give examples of socle equivalences arising from Hochschild extensions of hereditary algebras.

Day–Hour

Day: Thursday, june 21

Hour: 10:30–11:30