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Rigid homomorphisms between finite length modules over a discrete valuation ring

The category $\mathcal{L}_R$ of finite length modules over a discrete valuation ring R is easy to understand: its isomorphism classes correspond bijectively to partitions. However, the category of homomorphisms between finite length R-modules is "wild" and a complete classification of the orbits in $\mathrm{Hom}_R(X,Y)$ under the action of $\mathrm{Aut}_R(X) \times \mathrm{Aut}_R(Y)$ (for all $X, Y \in \mathcal{L}_R$) in terms of normal forms is a hopeless task.

Some time ago we could show that $\mathrm{Hom}_R(X,Y)$ always admits a unique orbit of "rigid" or "generic" homomorphisms. (In the case of the formal power series algebra $R = \mathbf{C}[[T]]$, this means precisely that with respect to the Zariski topology there is a dense open orbit; in the case of the ring of p-adic integers $R = \mathbf{Z}_p$ a similar geometric interpretation can be achieved, using the formalism of Witt vectors.) Moreover we classified the indecomposable rigid homomorphisms, which surprisingly turn out to be certain "strings".

In our talk we will present an algorithm which constructs for given $X, Y \in \mathcal{L}_R$ the essentially unique rigid homomorphism $X \to Y$.