

Abstract

In this paper we generalize Artin-Verdier, Esnault and Wunram construction of McKay correspondence to arbitrary Gorenstein surface singularities. The key idea is the definition and a systematic use of a degeneracy module, which is an enhancement of the first Chern class construction via a degeneracy locus. We study also deformation and moduli questions. Among our main result we quote: a full classification of special reflexive MCM modules on normal Gorenstein surface singularities in terms of divisorial valuations centered at the singularity, a first Chern class determination at an adequate resolution of singularities, construction of moduli spaces of special reflexive modules, a complete classification of Gorenstein normal surface singularities in representation types, and a study on the deformation theory of MCM modules and its interaction with their pullbacks at resolutions. For the proof of these theorems it is crucial to establish several isomorphisms between different deformation functors, that we expect that will be useful in further work as well.