FLATTENING OF MORPHISMS AND APPLICATIONS TO SINGULARITIES OVER PERFECT FIELDS

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Let A be a noetherian domain and M a finitely generated A-module. A theorem of Lipman provides, in a natural manner, a projective birational morphism $f : X \to Spec(A)$ with the property that the coherent sheaf $f^*(M)$, modulo torsion, is locally free over X. Furthermore, the morphism f is universal with this property.

In the particular case in which M is an ideal in A, then, as expected, the morphism f is simply the blow-up of $Spec(A)$ at M.

In general there is a procedure to compute an ideal I, in terms of a presentation of the A-module M, so that the universal morphism f is the blow-up at I. Despite the fact that the computation of I is difficult from the point of view of its complexity, some examples will be presented.

We will discuss how these morphisms relate with Grothendieck's theorem of flattening of projective morphisms.

Finally we will indicate some suggestive applications of these techniques to the study of singularities over perfect fields.