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On the notion of quasi-ordinary singularities in positive characteristics: Teissier singularities and their resolution

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Abstract

A singularity $(X, 0)$ of dimension d is quasi-ordinary with respect to a finite projection $p : (X, 0) \rightarrow \mathbb{C}^d$ if the discriminant of the projection is a normal crossing divisor. These singularities are at the heart of Jung's approach to resolution of singularities (in characteristic 0). In positive characteristics, these singularities are not useful from the point of view of resolution of singularities, since their resolution problem is almost as difficult as the resolution problem in general. Using a weighted version of Hironaka's characteristic polyhedron and successive embeddings of the singularity in affine spaces of higher dimensions, we introduce the notion of Teissier singularities which coincides with the quasi-ordinary notion in characteristic 0, but is very different in positive characteristics. We prove that a Teissier singularity $(X, 0)$ defined over \overline{F}_p sits in an equisingular family χ over $\text{Spec}(O_{\mathbb{C}_p})$ as a special fiber, and the generic fiber of χ has only quasi-ordinary singularities. Note that the generic fiber is defined over a field of characteristic 0. Here, equisingular means that we have a simultaneous resolution of χ . This is a joint work with Bernd Schober.

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