Hypersurfaces with linear type singular subscheme

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Abstract

Let $R = k[x_1, \ldots, x_n]$ be a polynomial ring over an algebraically closed field k of characteristic zero. Let $X = V(f) \subset \mathbb{A}^n_k$ be a reduced singular hypersurfaces which defined by a reduced polynomial $f \in R$. The singular locus of X is defined by the Jacobian ideal $I_f = (f, J_f)$, where $J_f = (\partial f/\partial x_1, \ldots, \partial f/\partial x_n)$ is so called the gradient ideal. We say that the hypersurface X is of *Jacobian linear type* if the Jacobian ideal $I_f \in R$ is of linear type, i.e., the symmetric algebra of I_f is isomorphic with the corresponding Rees algebra.

The principal question motivated this lecture is: which singular hypersurfaces are of Jacobian linear type? In this talk, we give necessary and sufficient criterion for reduce hypersurface only with isolated singularities to be of Jacobian linear type. We prove that a projective hypersurface is of *gradient linear type* if and only if the corresponding affine hypersurface in the affine chart associated to singular point is locally Eulerian. We show that any projective plane curve with simple singularities(ADE) is of Jacobian linear type.