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Frobenius Splittings and the Desingularization of Hypersurfaces in Positive Characteristic

Frobenius splittings are useful tools for various questions in commutative algebra and algebraic geometry. For example, the Frobenius map for rings can be used to show that a given affine variety is reduced, and its extension to schemes appears in results involving Schubert varieties. I will show that Frobenius splittings can also be used to address the problem of resolving singularities in positive characteristic. In its simplest form, a resolution of singularities is a birational map from a smooth algebraic variety to a singular one. Desingularization in positive characteristic has remained a difficult problem, mostly because characteristic zero techniques fail in this setting. Working in the affine hypersurface case, I will show why curves and surfaces that define Frobenius splittings can be desingularized without alteration to the characteristic zero algorithm.