Base Points and Polynomial Surface Reparametrizations

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Abstract

We present an algorithm for reparametrizing birational surface parametrizations into birational polynomial surface parametrizations without base points, if they exist. For this purpose, we impose a transversality condition to the base points of the input parametrization. Furthermore, we need some properties concerning base points. In particular, we show that the multiplicity of the base points locus of a projective rational surface parametrization can be expressed as the degree of the content of a univariate resultant. We use the degree formula relating the degree of the surface, the degree of the parametrization, the base points multiplicity, and the degree of the rational map induced by the parametrization. In addition, we extend both formulas to the case of dominant rational maps of the projective plane and describe how the base point loci of a parametrization and its reparametrizations are related. As an application of these results, we present some applications to algebraic and differential equations.