On Apparent Singularities of Systems of Linear Differential Equations with Rational Function Coefficients

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Abstract

Let (S) $\frac{dY}{dz} = A(z)Y$ be a system of first order linear differential equations with rational function coefficients. The (finite) singularities of (S) are the poles of the entries of the matrix A(z). A singular point z_0 of (S) is called an apparent singularity for (S) if there is a basis of solutions of (S) which are holomorphic in a neighborhood of z_0 . In this talk we shall present a new algorithm which, given a system of the form (S), detects apparent singularities and constructs an equivalent system (S') with rational coefficients, whose singularities coincide with the non apparent singularities of (S). Our method can, in particular, be applied to the companion system of any linear differential equation with arbitrary order n. We thus have an alternative method to the standard methods for removing apparent singularities of linear differential operators. We shall compare our method to the one designed for operators and we shall show some applications and examples of computation. This talk is based on a joint work, with S. Maddah, recently presented at ISSAC 2015.