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DIFFERENTIAL GALOIS GROUPS OF CONFLUENT GENERALIZED HYPERGEOMETRIC EQUATIONS: AN APPROACH USING STOKES MULTIPLIERS

CLAUDE MITSCHI

In memory of Ellis Kolchin

We explicitly compute the differential Galois groups of some families of generalized confluent hypergeometric equations by a method based on the asymptotic analysis of their irregular singularity at infinity. We obtain the Galois group directly from a particular set of topological generators. These are formal and analytic invariants of the equation, reflecting the asymptotic behaviour of the solutions. Our calculations yield classical groups as well as as the exceptional group G_2.

0. Introduction.

The differential Galois groups of all irreducible confluent hypergeometric differential equations have been determined by Katz and Gabber, after previous work of Beukers, Brownawell and Heckman (see [**BBH**] and [**K2**]). Their proofs use purely algebraic arguments, and rely on global characterizations of semisimple algebras. The aim of the present paper is to recover these differential Galois groups in a number of cases by explicitly giving some of their topological generators. It is indeed a classical result of Schlesinger that the local differential Galois group of a meromorphic differential operator at a regular singular point is topologically generated by the monodromy acting on a fundamental solution. The presence of exponential factors in formal solutions at an irregular singularity and the fact that the corresponding formal series may be divergent give rise to new Galois automorphisms, reflecting the asymptotic behaviour of the solutions. These particular automorphisms of a solution field are the elements of the exponential torus, the Stokes multipliers and the formal monodromy, which together generate the differential Galois group topologically by a theorem of Ramis (cf. [**R1**], [**MR2**]). We show how Ramis's theorem can be applied to determine explicitly the differential