Johann Radon Institute for Computational and Applied Mathematics Austrian Academy of Sciences (ÖAW)

Group Seminar

Symbolic Computation

Symbolic integration on D-finite foliations

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Tuesday, May 28, 2019, 09:00
RICAM, SP2 416-1

Abstract

A D-finite variety $\mathcal{F}$ is given by the zero set of a multivariate function solution of a D-finite system of partial differential equations. Such variety $\mathcal{F}$ is typically not algebraic, and thus comes with a Galois action which generates a foliation. Now considering a rational function on $\mathcal{F}$, we will be interested in the problem of indefinite integration. The traditional approach is to consider elementary functions, however here, due to the Galois action on $\mathcal{F}$, such integration problem naturally contains parameters, which poses the question of a possible creative telescoping approach. It happens that in contrary to the algebraic case, a telescoper does not always exit, and when it does it can be of arbitrary order but with very restrictive properties. In this case the integral is a D-finite function restricted to $\mathcal{F}$, and often not elementary even when $\mathcal{F}$ is elementary. We will present several approaches in dimension 2, and an integration algorithm in the case of Darbouxian foliations.