Factorization of Linear Differential Operators

Ziming Li

Wuhan, 16-27/04/2012

Many algorithms for computing closed-form solutions of linear differential equations are based on differential Galois theory. In these algorithms, we often assume certain irreducibility of differential equations in order to use powerful results in the theory. This renews our interest in factoring differential operators, a classical topic, which can be dated back to the end of the nineteenth century.

In this course, we describe algebraic settings for factoring linear differential operators, introduce various algorithms, and review the theoretic results about the structure of factors.

The course consists of five lectures:

1. Ring of differential operators and Beke's algorithm,

2. Module-theoretic approach to factoring differential operators,

3. Eigenrings,

4. Factoring linear PDE's with finite-dimensional solutions spaces,

5. Recent results on factoring linear PDE's.

The course will be elementary and introductory.