Abstract for:

Integer sequences, algebraic series and differential operators

PhD defense

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July 6th, 2023

Like the dissertation, the presentation will address mathematical and algorithmic problems and questions connected to integer sequences, algebraic series and differential operators. I am going to briefly summarize the main contributions and ideas of each of the thesis' chapters.

Explicitly, I will first show that a family of hypergeometric sequences can be represented as diagonals, then express the generating function of the Dubrovin-Yang-Zagier numbers in closed form, and provide a new formula for the reduced volume of any projection of the Clifford torus. Further, I will present three new algorithms solving the following problems more efficiently than previously possible: The computation of the N-th term of a q-holonomic sequence, the computation of the N-th power of a polynomial matrix, and the decision whether a given polyhedron has Rupert's property. Finally, like in the thesis, I will also answer the following three explicitly stated but previously open questions: Is the Fibonacci sequence $(F_n)_{n\geq 0}$ a constant term sequence? (No), Does the q-analog of Pólya's Theorem hold? (Not in general but for some $q \in \mathbb{C}$), Does the Truncated icosidodecahedron have Rupert's property? (Yes).

Finally, if time permits, I will speak about some interesting open questions, problems and conjectures related to the topic of the dissertation.