

Holonomic Techniques for Feynman Integrals



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Symbolic summation and integration techniques to simplify Feynman integrals

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We present tools from symbolic summation and integration that are tailored for Feynman integrals. In particular, we will present algorithms that enable one to produce linear differential or difference equations that contain the input expression (e.g., in form of definite hypergeometric multisums, hyperexponential multiintegrals or coupled systems of linear differential equations) as solution. In a nutshell, we show constructively that the given input expressions of Feynman integrals are holonomic. Given such equations one can then look for closed form solutions, e.g., in terms of iterative integrals and sums (which are again holonomic). This leads usually to rather compact expressions that can be used for asymptotic expansions or analytic continuation. We will report on these different tools that we have applied within our long-term cooperation between RISC and DESY (Deutsches Elektronen-Synchrotron) and demonstrate their flexibility.

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