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Factoring Difference Operators in Maple 2021.

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The LREtools package in Maple 2021 contains algorithms I implemented for factoring difference operators. This talk gives an overview of these algorithms. Algorithm MinimalRecurrence constructs a recurrence of proved minimal order for a sequence given by initial conditions and a (not necessarily minimal) recurrence. The degree-bound that is needed for the proof is constructed from asymptotic data computed by algorithm GeneralizedExponents. Algorithm RightFactors computes right-factors of recurrence operators. It contains two implementations. One implementation provably computes all (potentially infinitely many) right-factors of a specified order. The other is a fast heuristic that applies algorithm MinimalRecurrence to certain initial conditions. One application of these factoring implementations is algorithm SumDecompose, which can check if a solution of a recurrence can be written as sums of solutions of lower order recurrences, and if so, find such a decomposition. Factoring is also key to finding closed form solutions of higher order recurrence relations.

Keywords
Difference Operators, Factoring, Symbolic Computation.

References
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