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m-fold hypergeometric solutions of linear recurrence equations revisited. (English summary)

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Given a linear recurrence with polynomial coefficients in $F[x]$ (F is a field containing the rational numbers) using the classical shift operator S, i.e., $S(x) = x + 1$, and given a positive integer m, the authors present algorithms to compute all right factors of the form $S^m - a$ with a from $K(x)$. In addition, they consider this problem for the q-case, i.e., by taking the shift operator $S(x) = qx$ where $F = K(q)$ is a rational function field. More precisely, utilizing an adapted version of an m-fold Newton polygon, they extend the ideas of van Hoeij's algorithm to the m-fold case and to the q-case. In addition, using the properties of the Newton polygon, they obtain more efficient versions of the known variants of Petkovšek's algorithm (i.e., the 1-fold version/m-fold version and the classical version/q-case version). The article is supplemented by concrete examples using a Maple package.

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