
RICHARD M. SLEVINSKY, University of Manitoba

Fast and stable rational approximation of generalized hypergeometric functions

Rational approximations of generalized hypergeometric functions ${}_pF_q$ of type $(n+k, k)$ are constructed by the Drummond and factorial Levin-type sequence transformations. We derive recurrence relations for these rational approximations that require $\mathcal{O}[\max\{p, q\}(n+k)]$ flops. These recurrence relations come in two forms: for the successive numerators and denominators; and, for an auxiliary rational sequence and the rational approximations themselves. Numerical evidence suggests that these recurrence relations are much more stable than the original formulae for the Drummond and factorial Levin-type sequence transformations. Theoretical results on the placement of the poles of both transformations confirm the superiority of factorial Levin-type transformation over the Drummond transformation.