Extended procedures for convergence acceleration

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Let (S_n) be a sequence of real or complex numbers converging to a limit S_∞. If the convergence is slow, it will be transformed into a new sequence (T_n) converging to the same limit by a *sequence transformation*. The idea behind a sequence transformation is *extrapolation to the limit*. Well–known examples of this idea are Richardson's extrapolation and Aitken's Δ^2 processes. It is important to study many different sequence transformations since it was proved that a transformation able to accelerate the convergence of all sequences cannot exist.

In this talk, new procedures for the extrapolation to the limit of slowly convergent sequences and functions are proposed. They are based on the notions of error estimates and annihilation operators. We obtain generalizations of the discrete and confluent E-transformation, which are the most general sequence and function transformations known so far. Many transformations yet studied are included into the new formalism.

Particular cases, such as Drummond's transform and extensions are given. A new expression for the E–transformation, using generalized divided differences, is also obtained, and generalized.

These transformations are related to Padé and Padé-type approximants.

This is a joint work with C. Brezinski (Laboratoire Paul Painlevé, Université des Sciences et Technologies de Lille, France).