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Nonlinear Oscillatory Expansions of holomorphic functions

In 1995, R. Coifman discovered a nonlinear analogue of Fourier series called Blaschke unwinding series. This iterative Blaschke factorisation has a wide range of practical applications, but it is not well understood. In recent years, the method has been rediscovered by T. Qian et al. and extensively studied, while Coifman and collaborators have studied other unwindings and convergence in given function spaces such as orthogonal decompositions of invariant subspaces of Hardy spaces.

We present results that explain why this Blaschke factorisation only corresponds to a specific (and the most simple) type of unwinding of holomorphic functions, and, using techniques from operator theory, we give necessary and sufficient conditions for the convergence of the unwinding series.