On Generating Series and Convergence of Interconnected Analytic Nonlinear Systems

W. Steven Gray
Old Dominion University

Abstract

Most complex systems encountered in applications can be viewed in terms of interconnections of more elementary subsystems. A natural class of nonlinear systems to consider in this context is the set of analytic input-output systems known as Fliess operators. Such operators are described by convergent functional series which are indexed by words over a noncommutative alphabet. Their generating series are therefore specified in terms of noncommutative formal power series. In this presentation, the generating series for four basic interconnection types are described, namely, the parallel, product, series and feedback connections, and the convergence properties of each composite system are described. In particular, the most recent work on computing the radius of convergence of such systems is discussed.