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Joseph A. Ball* (ball@math.vt.edu), Department of Mathematics, Virginia Tech, Blacksburg, VA 24061. *Exotic linear systems and formal power series with application to robust control.*

Discrete-time multidimensional linear systems can be seen as analogues of standard discrete-time linear systems where a multidimensional integer lattice replaces the integers as the “time-domain”. These systems have transfer functions equal to an analytic function of several complex variables rather than a single complex variable. Such systems arose in image processing applications in the 1970s and also can be seen as the result of finite-difference discretization of certain types of PDEs. A more exotic type of multidimensional linear system is to let the “time-domain” be a finitely generated free semigroup with transfer function then equal to a formal power series in noncommuting indeterminants. We discuss system-theoretic properties (e.g., Kalman decomposition, state-space similarity theorem, bounded-real lemma) for such systems and connections with robust control for standard linear systems subject to various types of structured uncertainty. (Received August 23, 2005)