An algebraic and graph theoretic framework to study monomial dynamical systems over a finite field

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A monomial dynamical system over a finite field K is a nonlinear deterministic time discrete dynamical system with the property that each of the n component functions is a monic nonzero monomial function in n variables. In this paper we provide an algebraic and graph theoretic framework to study the dynamic properties of monomial dynamical systems over a finite field. Within this framework, characterization theorems for fixed point systems (systems in which all trajectories end in steady states) are proved. In particular, we present an algorithm of polynomial complexity to test whether a given monomial dynamical system over a finite field is a fixed point system. Furthermore, theorems that complement previous work are presented and alternative proofs to previous results are supplied.
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