Attractivity in Nonautonomous Periodic and Random Difference Equations on Compact Spaces

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Discrete-time dynamical systems driven by periodic and random inputs arise as models in many areas such as population biology, epidemiology, neural networks etc.. We consider periodic difference equations and random difference equations which arise respectively when the driving sequence acting as an input is periodic and when as a stationary stochastic process. Among the fundamental entities in understanding the asymptotic behavior of such systems are nonautonomous attractors like pullback, forward and uniform attractors [1].

A difficulty some of the nonautonomous attractors pose is that their existence is unknown. We present some results on the existence of a notion of uniform attractivity for random difference equations on a compact space. In particular, with a typical path-wise consideration, we define certain autonomous attracting sets and show that each such set contains a local positively-invariant uniform attractor. In the case of periodic difference equations we relate the existence of a *globally asymptotically stable periodic solution* to nonautonomous attractors and also to what is known as the *echo state property* of a driven system [2].

References

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