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Stochastic control stabilizing unstable or chaotic maps. (English) Zbl 1411.39009

Summary: This paper considers a stabilizing stochastic control which can be applied to a variety of unstable and even chaotic maps. Compared to previous methods introducing control by noise, we relax assumptions on the class of maps, as well as consider a wider range of parameters for the same maps. This approach allows to stabilize unstable and chaotic maps by noise. The interplay between the map properties and the allowed neighbourhood where a solution can start to be stabilized is explored: as instability of the original map increases, the interval of allowed initial conditions narrows. A directed stochastic control aiming at getting to the target neighbourhood almost sure is combined with a controlling noise. Simulations illustrate that for a variety of problems, an appropriate bounded noise can stabilize an unstable positive equilibrium, without a limitation on the initial value.

MSC:
39A50 Stochastic difference equations
37H10 Generation, random and stochastic difference and differential equations
93D15 Stabilization of systems by feedback
39A30 Stability theory for difference equations

Keywords:
stochastic difference equations; stabilization; control; Kolmogorov’s law of large numbers; multiplicative noise

Full Text: DOI

References:


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