

Stabilization of unstable and chaotic models of population dynamics by target oriented and stochastic control

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Structured discrete population models are able to fit and predict chaotic experimental data. However, most of the chaos control techniques in the literature have been designed and analyzed in a one-dimensional setting. By introducing target oriented control for discrete dynamical systems, we prove the possibility to stabilize a chosen state for a wide range of structured population models. The results are illustrated with introducing a control in the celebrated LPA model [1] describing a flour beetle dynamics. Moreover, we show that the new control allows to stabilize periodic solutions for higher order difference equations, such as the delayed Ricker model, for which previous target oriented methods were not designed [2]. The second part of our talk outlines the possibility to stabilize otherwise unstable or even chaotic equation by noise only [3]. However, for chaotic maps stabilization comes at a price: the interval of allowed initial conditions becomes incredibly small. A combination of a stochastic control with eventual noise control allows to relax conditions on both the initial value and the parameters of the equation.

References

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