

Stability Analysis and the Role of Non-Self Adjointness

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Abstract

Stability analysis addresses the reaction of a non-linear dynamical system to an outside perturbation, that is, one not addressed by the original model. The system can have two broad classes of responses: the perturbation subsides and the system returns to its original trajectory, or the perturbation grows and the system follows a new trajectory. Traditional modal analysis only considers stability after the perturbation, in the $t \rightarrow \infty$ limit. However appropriate for certain dynamical systems, for others, this time scale only allows the introduction of more perturbations, that is, ones not assumed by the $t \rightarrow \infty$ analysis. Such perturbations can either push the system away from or drive it back towards its equilibrium. This project examines the stability of one non-linear dynamical system, and shows that for ecological systems, stability must be considered in both the short and long term, $t \rightarrow 0$ and $t \rightarrow \infty$, respectively.