

Basin Instability

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Outline

Basins of attraction

Basin instability for fixed points

Basin instability for limit cycles

Basin instability in the RMA model

Blocks in Beamer

Attractors

Consider the system

$$\dot{x} = f(x; p).$$

with an associated flow φ_t .

Definition (Attractor)

An *attractor* is an invariant set of points $\Gamma(p)$ depending on the parameters p such that for some initial condition x_0

$$\inf_{\gamma \in \Gamma(p)} |\varphi_t(x_0) - \gamma| \rightarrow 0$$

as $t \rightarrow \infty$.

Basins of attraction

We have an attractor $\Gamma(p)$ if we find some initial condition x_0 that limits to it. Thus, we define

Definition (Basin of attraction)

$$B(\gamma, p) = \{x_0 : \varphi_t(x_0) \rightarrow \Gamma(p) \text{ as } t \rightarrow \infty\}$$

with the distance metric defined before.

An example basin of attraction