Bifurcation in parameter dependent systems

Numerical Methods for Systems Biology WS 12/13

Jonas Ibn-Salem

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Overview

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Example: Logistig growth with harvesting

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Introduction: Fixed Point Analysis

Given the system of differential equations:

$$y' = f(y)$$

Definition

A fixed point y^* is defined by $f(y^*) = 0$.

- Solve the equation f(y) = 0
- Analyse eigenvalues of the Jacobian at fixed points.

Now: System with controle parameter μ .

$$y'=f(y,\mu)$$

 \Rightarrow How does μ influence the number, location and stability of fixed points?

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Bifurcation

Definition

Bifurcation is the changing of the character of an equalibrium point and/or the creation of extra ones by alteration of a control parameter.

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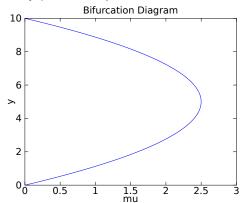
Example: Logistig growth with harvesting

Growth of a population:

$$y' = \frac{1}{10}y(10 - y) - \mu$$

Solving $f(y, \mu) = 0$ for any parameter μ .

Bifurcation Diagram:



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