INLDS Practicum 13

Use the `MATLAB` bifurcation software `MatCont` to study the following systems and try to understand essential features of their phase portraits by relating your observations with the theory.

Exercises

Ex.1 Arneodo system with a saddle-focus homoclinic bifurcation

$$\begin{cases} \dot{x} &= y, \\ \dot{y} &= z, \\ \dot{z} &= cx - by - z - x^2. \end{cases} \tag{1}$$

Fix $b = 0.5$ and simulate the system at $c = 0.960$ and $c = 0.965$. Which Shilnikov bifurcation happens between these two parameter values ? Approximate the bifurcation parameter value c_{HOM} numerically.

Ex.2 "Blue-sky"bifurcation in Gavrilov-Shilnikov system

$$\begin{cases} \dot{x} &= x(2 + \mu - b(x^2 + y^2)) + z^2 + y^2 + 2y, \\ \dot{y} &= -z^3 - (y + 1)(z^2 + y^2 + 2y) - 4x + \mu y, \\ \dot{z} &= z^2(y + 1) + x^2 - \varepsilon. \end{cases} \tag{2}$$

Fix $(b, \varepsilon) = (10, 0.02)$ and simulate the system at $\mu = 0.4$ and $\mu = 0.25$. Which bifurcation happens between these two parameter values ? Approximate the bifurcation parameter value μ_{BS} numerically.

Homework

There is no hand-in exercise.