Continuation of point-to-cycle and cycle-to-cycle connections in 3D-ODEs

Yuri A. Kuznetsov (UU)

It will be shown how easily one can locate and continue numerically point-to-cycle and cycle-to-cycle connecting orbits in 3-dimensional autonomous ODE's. In our approach the projection boundary conditions near the cycles are formulated using eigenfunctions of the associated adjoint variational equations, thus avoiding computation of the monodromy matrices. The equations for the eigenfunctions are included in the defining boundary-value problem, allowing a straightforward implementation in AUTO, in which only the standard features of the software are used. Homotopy methods to find the connecting orbits will be discussed in general and illustrated with an example from population dynamics. In this food-chain model, point-to-cycle and homoclinic cycle-to-cycle orbits exist and can disappear via pairwise collisions, which we also compute. In particular, this model provides an example of the famous Poincaré homoclinic structure in population dynamics.