

A New Python based Toolbox for Stability and Bifurcation Analysis of Hybrid Dynamical Systems

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In this paper, we introduce a new python based general-purpose toolbox for numerical analysis of hybrid dynamical systems. It achieves the following.

- To calculate the time domain behaviour of the system (linear or nonlinear subsystems) starting from any initial condition.
- To locate the periodic orbits (stable as well as unstable) and to compute their stability. This is done using the shooting method, where the computation of the fundamental solution matrix takes into account the switching events through appropriate saltation matrices and state transition matrices. Thus, while the Newton-Raphson search converges on the periodic orbit, the Jacobian matrix also converges and hence the eigenvalues can be calculated with no extra computational effort. The program can do so even when each subsystem is nonlinear [1].
- To handle high dimensional switching systems with a larger number of subsystems.
- To analyse any hybrid systems including impact system, robotic system, power system etc.

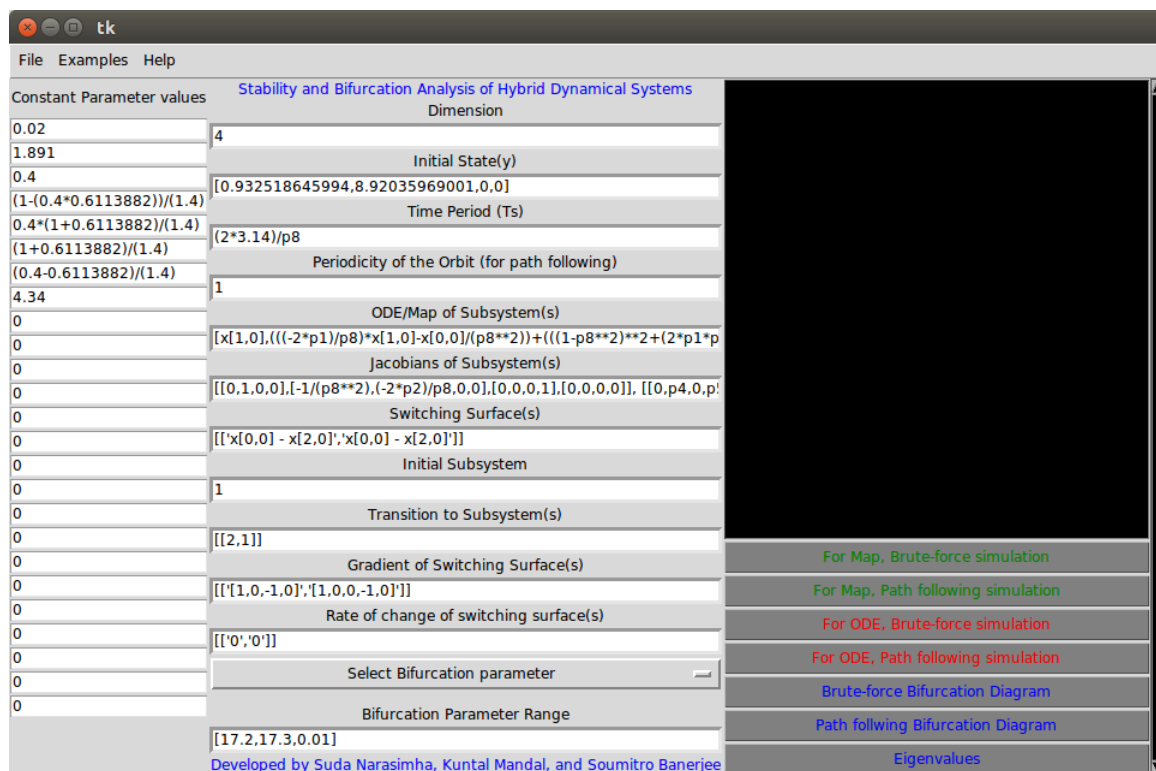


Figure 1: Screenshot of the graphical user interface of the toolbox

References

- [1] Mandal, K., et al. "An automated algorithm for stability analysis of hybrid dynamical systems." The European Physical Journal Special Topics 222.3-4 (2013): 757-768.

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