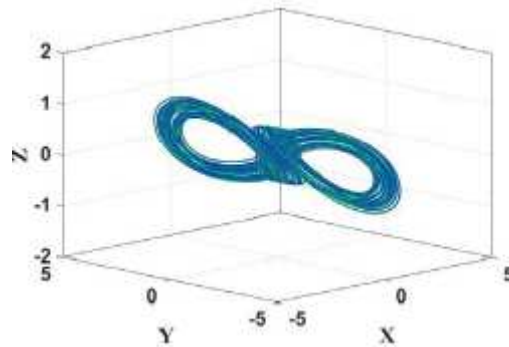


HYPERCHAOTIC SNAP OSCILLATOR OF VAN DER POL-DUFFING FOR DESCRIBING SYSTEMS IN PHYSICS, ENGINEERING AND BIOLOGY

Lab project proposal for M1 CompuPhys 2020-2021



Keywords : hyperchaos, coexisting attractors, multistability, numerical simulation

Oscillators of Van der Pol and Duffing are examples of nonlinear oscillators with applications in modelling of the cardiac system and of magneto-elastic mechanical systems. An autonomous two-dimensional VPD oscillator is converted to a snap oscillator, whose dynamical behaviour creates coexisting attractors and chimera states. This is one of the most extensively studied self-excited oscillators that can be employed to model systems in physics, biology and engineering.

The project includes, as the first part, a bibliographic study of non-linear oscillators and their applications. Then, an example of an hyperchaotic van der Pol-Duffing snap oscillator will be studied. The differential equations governing the considered system will be understood and solved numerically (programming in MatLab and/or Fortran and/or Python) to get access to the dynamical properties which will be investigated by the use of Lyapunov exponents, equilibrium points, bifurcation graphs and stability analyses.

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