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The use of continuation methods to obtaining periodic orbits in Hamiltonian and dissipative systems

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SUMMARY

We describe the use of the numerical continuation software AUTO[1] for the computation of periodic orbits in both Hamiltonian and dissipative systems. This software uses a boundary value problem for the continuation of orbits that we can utilize to find families of periodic orbits.

As an example, we show how to compute periodic orbits in some known dissipative systems such as the Lorenz[2] or Rössler[3] systems. We are also able to find some interesting curves of bifurcations for these systems.

However, in the case of Hamiltonian systems, that have a constant of motion such as the energy that does not appear in the equations, we have to add an unfolding term with an unfolding parameter to be able to transform our system in one that our continuation software can solve. We apply this strategy to some problems: First to study the evolution of the normal modes in the classical dynamics of the rare gas-dihalogen $Ne \cdots Br_2$ complex[4] in its ground electronic state. Finally, we compute some non symmetric periodic orbits that appear in a quartic hamiltonian system[5] with symmetries in a bifurcation from a symmetric family.

Keywords: continuation software, periodic orbits

AMS Classification: 37G15, 37C27

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