ATELIER
≪ MOUVEMENTS PLANÉTAIRES, DYNAMIQUE DES SATELLITES ET ORBITES DES ENGINS SPATIAUX ≫
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WORKSHOP
"PLANETARY MOTIONS, SATELLITE DYNAMICS, AND SPACESHIP ORBITS"
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Boundary-value problem formulations for computing invariant manifolds and connecting orbits in the circular restricted three body problem

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I will demonstrate the effectiveness of boundary value formulations coupled to numerical continuation for the computation of stable and unstable manifolds in systems of ordinary differential equations. Specifically, I will consider the Circular Restricted Three-Body Problem (CR3BP), which models the motion of a satellite in an Earth-Moon-like system. The CR3BP has many well-known families of periodic orbits, such as the planar Lyapunov orbits and the non-planar Vertical and Halo orbits. We compute the unstable manifolds of selected Vertical and Halo orbits, which in several cases leads to the detection of heteroclinic connections from such a periodic orbit to invariant tori. Subsequent continuation of these connecting orbits with suitable end point conditions, and allowing the energy level to vary, leads to the further detection of apparent homoclinic connections from the base periodic orbit to itself, or the detection of heteroclinic connections from the base periodic orbit to other periodic orbits. Some of these connecting orbits may be of potential interest in space mission design.

This is joint work with Renato Calleja, Tony Humphries, Alexandra Lemus-Rodriguez, and Bart Oldeman.

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