

Numerical continuation of families of homoclinic connections of periodic orbits in the RTBP

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Abstract

The goal of this paper is the numerical computation and continuation of homoclinic connections of the Lyapunov families of periodic orbits (p.o.) associated with the collinear equilibrium points, L_1 , L_2 and L_3 , of the planar circular restricted three-body problem (RTBP). We describe the method used that allows us to follow individual families of homoclinic connections by numerical continuation of a system of (nonlinear) equations that has as unknowns the initial condition of the p.o., the linear approximation of its stable and unstable manifolds and a point in a given Poincaré section in which the unstable and stable manifolds match. For the L_3 case, some comments are made on the geometry of the manifold tubes and the possibility of obtaining trajectories with prescribed itineraries.

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(Some figures in this article are in colour only in the electronic version)

1. Introduction

Homoclinic and heteroclinic connections of hyperbolic invariant sets play an important role in the study of dynamical systems from a global point of view. Of special interest is their application to the design of space missions using libration point dynamics. Among the libration point missions up to present [10], Genesis [18] has been the first one to make use of a heteroclinic connection. The use of homoclinic and heteroclinic phenomena allows more