Some particularities of the collinear point L_3 in the RTBP

E. Barrabés¹, J. M. Mondelo² and M. Ollé³

¹ Dept. Informàtica i Matemàtica Aplicada Universitat de Girona Avd. lluís Santaló s/n, 17071 Girona, Spain.

² Dept. Matemàtiques, Universitat Autònoma de Barcelona, 08193 Bellaterra, Barcelona, Spain.

³ Dept. Matemàtica Aplicada I. Universitat Politècnica de Catalunya, Diagonal 647, 08028 Barcelona, Spain.

e-mail: barrabes@ima.udg.es, jmm@mat.uab.es, merce.olle@upc.edu

Abstract

We are interested in studying the motion in a (big) neighborhood of the collinear equilibrium point L_3 of the RTBP. We consider both the planar and spatial cases. Actually different kinds of invariant objects appear: periodic orbits, invariant tori, the associated invariant manifolds, collision manifolds and homoclinic and heteroclinic phenomena among others. In this communication, we just present some particularities of L_3 and its 1-dimensional manifolds to show the difficulties that we have to cope with in order to give a global description of the motion in a global neighborhood of $_3$.

Key words and expressions: Restricted three-body problem, equilibrium point, periodic orbits, invariant tori, manifolds.

1 Introduction

Our framework is the circular RTBP, whose well known equations of motion depend on the mass parameter $\mu \in (0, 1/2]$, and in a rotating reference system are

$$\begin{array}{rcl} \ddot{x}-2\dot{y} &=& \Omega_{x},\\ \\ \ddot{y}+2\dot{x} &=& \Omega_{y},\\ \\ \ddot{z} &=& \Omega_{z}, \end{array}$$

where

$$\Omega = \frac{1}{2}(x^2 + y^2) + \frac{1 - \mu}{r_1} + \frac{\mu}{r_2} + \frac{1}{2}\mu(1 - \mu)$$