HOMOCLINIC AND HETEROCLINIC SOLUTIONS IN THE RESTRICTED THREE-BODY PROBLEM

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Abstract. In this work we have performed a systematic computation of the homoclinic and heteroclinic orbits associated with the triangular equilibrium points of the restricted three-body problem. Some analytical results are given, related to their number when the mass ratio varies.

1. Introduction

From the time of Strömgren [4] it has been known that some families of periodic orbits of the restricted three-body problem end at an 'orbit' formed by a pair of heteroclinic orbits connecting the two triangular equilibrium points. In fact, and for the value of the mass parameter equal to 1/2, Strömgren computed five symmetric heteroclinic orbits, some of whose combinations by pairs are natural endings of well-known families of symmetric periodic orbits (see [5]). Some homoclinic orbits (or asymptotic-periodic orbits, according to the classical nomenclature) were computed by Strömgren too. Families of periodic orbits ending at some of these last ones were given by Danby [1], Szebehely and Nacozy [6], and Szebehely and Van Flandern [7] for the mass ratio $\mu = 0.5$.

In the framework of analytic Hamiltonian systems, Henrard [3] proved Strömgren's conjecture, according to which a class of doubly asymptotic orbits are limit members of families of periodic orbits. Further results of Devaney [2] prove that this phenomenon occurs in both Hamiltonian and reversible systems.

In this work we have done a systematic computation of the homoclinic and heteroclinic orbits associated with the triangular equilibrium points of the restricted three-body problem. For that purpose a preliminar numerical study of the invariant stable and unstable manifolds related to those equilibrium points, has been done. Some

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