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Qualitative study of a charged restricted three-body problem

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ABSTRACT

We characterize the global flow of the restricted three-body problem in which we have two mass points of equal masses $m_1 = m_2 > 0$ and equal charge $q_1 = q_2$ moving on a straight line under Newtonian and Coulombian forces with their center of mass being fixed at the origin of coordinates and the third mass point with infinitesimal mass, is moving on the straight line perpendicular to the line of motion of the first two mass points and passing through their center of mass.

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1. Introduction

The classification of all the possible qualitative motions for the Newtonian three-body problem is an open and difficult problem. This leads to study several restricted subproblems, like the restricted three-body problem where one of the masses is assumed to be infinitesimally small. We consider the case when the two positive masses are equal, have the same charge and are moving under the respective Newtonian gravitational and Coulombian forces in an orbit on the *x*-axis while their center of mass is fixed at the origin of coordinates and the infinitesimal mass point is moving on the *y*-axis.

More precisely, let $m_1 = m_2$ be two mass points with the same charge $q_1 = q_2$ moving under the influence of the respective Newtonian gravitational and Coulombian forces in an orbit on the *x*axis while their center of mass is fixed at the origin of coordinates. We consider a third mass point with infinitesimal mass and no charge moving on the *y*-axis. As usual the two bodies with masses m_1 and m_2 are called the *primaries*. Since $m_3 = 0$ the motion of the two primaries is not affected

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