

PERIODIC ORBITS OF THE TWO FIXED CENTERS PROBLEM WITH A VARIATIONAL GRAVITATIONAL FIELD

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ABSTRACT. Within a given range of energy levels the two fixed centers problem under a variational gravitational field admits periodic orbits bifurcating from the Kepler problem. The analytical expressions of these periodic orbits are given when the mass parameter of the system is sufficiently small.

1. INTRODUCTION AND STATEMENT OF THE MAIN RESULT

It is well known that due to the non-integratable feature of the restricted three-body problem. Scientists have not yet obtained analytical expressions of its general solutions, and that its periodic orbits have extremely important applications in practical space missions. This fact which has attracted a large number of mathematicians and astronomers to carry out research on the periodic orbits of the restricted three-body problem (see [1] and the references therein). The extensive research covered three categories: qualitative analysis (see [1]-[4] and so on), analytical calculation (see [5]-[7]), and numerical simulation (see [8]-[13]).

For the case of the planar circular restricted three-body problem, Zotos [14] investigated the problem with two equivalent masses with strong gravitational field, which was controlled by power of the gravitational potential. They revealed the influences of the gravitational potential power on the nature of orbits. Based on the continuation method, Llibre and Paşca [15] proved that the circular and the elliptic symmetric periodic orbits of the planar rotating Kepler problem can be continued into periodic orbits of the planar collision restricted three-body problem. The method was also applied by Llibre and Makhlouf

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