Name of Scholar   :   Preeti Jain

Name of Supervisor   :   Prof. Naseem Ahmad

Name of Co- Supervisor   :   Prof. K. B. Bhatnagar

Department of Mathematics

Title of Thesis

Periodic orbits of collision in the plane elliptic restricted problem of three bodies when primaries are triaxial rigid bodies and source of radiation pressure

Abstract

We have investigated the existence of periodic orbits in the plane elliptic restricted three body problem when the smaller primary is an axis-symmetric rigid body when the mass parameter $\mu = 0$ and $\mu \neq 0$. The same problem has also been discussed with the characteristic of collision.

We have actually determined periodic orbits and periodic orbits with the characteristic of collision when $\mu \neq 0$ in the following four cases:

(i). When primaries are moving in circular orbits about their center of mass and the primaries are either point masses or spherical in shape.

(ii). When primaries are moving in circular orbits about their center of mass and the primaries are axis-symmetric rigid bodies.

(iii). When primaries are moving in elliptic orbits about their center of mass and the primaries are spherical in shape.

(iv). When primaries are moving in elliptic orbits about their center of mass and the primaries are axis-symmetric bodies.

We have observed that periodic orbits of collision expands with the increase in mass parameter μ, with the increasing effect of σ_1 and σ_2 of the axis-symmetric rigid body (where $\sigma_1 = \dfrac{a'^2 - c'^2}{5a''^2}, \sigma_2 = \dfrac{a'^2 - b'^2}{5a''^2}$; and a', b', c' are the semi- axes of the axis-symmetric rigid body), with the increasing effect of eccentricity e' (eccentricity of the orbit in which the primaries are moving) and finally in the elliptic case with the increased effect of σ_1 and σ_2 of the axis-symmetric rigid body.

We have also investigated the same problem by an absolutely different method and procedure initially given by Kransisky. We have shown the double collision in the plane elliptic restricted three body problem when the smaller primary is an axis-symmetric rigid body. These paths are shown for

1. $\sigma_1 = .01$ and $\sigma_2 = .009$

2. $\sigma_1 = .05$ and $\sigma_2 = .049$

3. $\sigma_1 = .09$ and $\sigma_2 = .085$

Under certain conditions we have also determined the approximate form of the respective paths for the above values of σ_1 and σ_2. These paths were also obtained by Levi- Civita in the restricted three body problem but our study is more general and is of great importance as such orbits are possible in flights to the moon and return to the earth under terrestrial and lunar attractions.