Abstract

The planar circular restricted three body problem (PCRTBP) models the motion of a massless body under the attraction of other two bodies, the primaries, which describe circular orbits around their common center of mass. In a suitable system of coordinates, this is a two degrees of freedom Hamiltonian system. The orbits of this system are either defined for all (future or past) time or eventually go to collision with one of the primaries. For orbits defined for all time, Chazy provided a classification of all possible asymptotic behaviors, usually called final motions.

By considering a sufficiently small mass ratio between the primaries, we analyze the interplay between collision orbits and various final motions and construct several types of dynamics.

We show that orbits corresponding to any combination of past and future final motions can be created to pass arbitrarily close to either one of the primaries. In particular, we also establish oscillatory motions accumulating to collisions. That is, oscillatory motions in both position and velocity, meaning that as time tends to infinity, the superior limit of the position and velocity is infinity while the inferior limit of the distance to one of the primaries is zero. Additionally, we construct arbitrarily

large ejection-collision orbits (or-bits which experience collision in both past and future times) and periodic orbits that are arbitrarily large and get arbitrarily close to either one of the primaries. Combining these results, we construct ejection-collision orbits connecting both primaries.