

## Abstract

The planar 2-body-2-center system is to study the system having two free particles and two fixed particles on the plane, and the motion of free particles under the gravitational influence of the whole system.

It can be seen as an extended version of 2-center problem. However, due to the interaction between two free particles, some important properties and effective techniques in  $N$ -center problem can not be used in 2-body-2-center problem (such as collision-reflection property). In this article, we show the existence of periodic solutions with different topological construction - non-crossing solutions, half-crossing solutions and crossing solutions.

In recent years, variational methods have been applied to construct many periodic solutions for  $N$ -body problem and  $N$ -center problem. Collision avoidance is often carried out by either local deformation or global estimates for the action functional.

Here, we will demonstrate several interesting results by using both of them.