1135-37-3021 **Tiancheng Ouyang*** (ouyang@math.byu.edu), Department of Mathematics, Brigham Young University, Provo, UT 84602. *Variational methods and numerical simulation on the N-body problem of celestial mechanics.*

According to Newton's Second Law, the motion of N point bodies with positive masses $m_1, m_2, \ldots, m_N$ located at positions $x_1, x_2, \ldots, x_N \in \mathbb{R}^3$ is governed by the system of second-order nonlinear vector differential equations

$$m_i \ddot{x}_i = \sum_{\substack{j=1, \\ j \neq i}}^{N} \frac{G m_i m_j (x_j - x_i)}{\|x_i - x_j\|^3},$$

where the derivative is with respect to the time variable t, and G is the universal gravitational constant.

In this talk, a brief introduction of the variational methods of N-body Problem from 2006– 2017 with emphasize on the work of boundary value problems for 3–5 body problems in 2D and 3D will be given.

Some numerical simulations of periodic and quasi-periodic orbits will be demonstrated. Very interested phenomenons of 3D orbits of solar system will be discussed. (Received September 26, 2017)