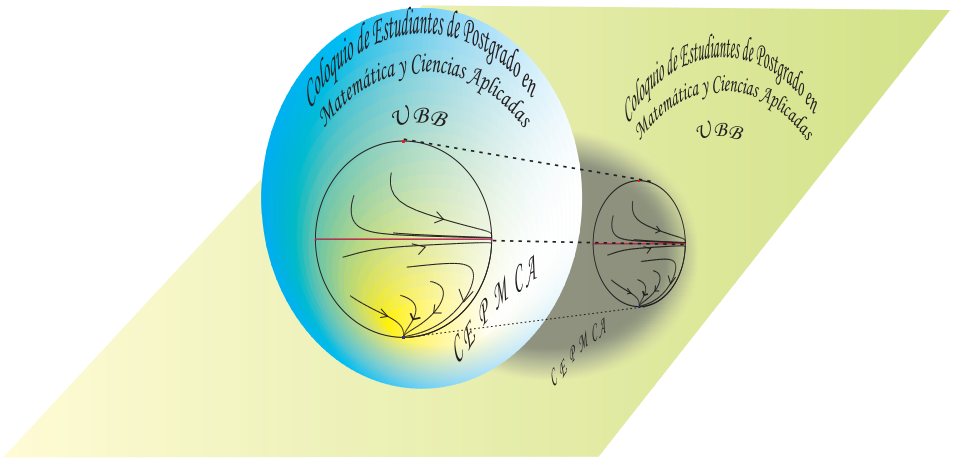
UNIVERSIDAD DEL BÍO-BÍO
FACULTAD DE CIENCIAS
DEPARTAMENTO DE MATEMÁTICA



Reduction and Relative Equilibria in Full Gravitational N-Body Problem

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Fecha : Miércoles 14 de abril de 2021
Lugar : Zoom meeting (ID 821 7483 4254, Password 484062)
Enlace : https://reuna.zoom.us/j/82174834254?pwd=TkhyWHlMQUR1WFFuOVNTY05LMnNEZz09
Hora : 19:00PM -20:00 PM (Santiago Time).

Abstract. We study the rota-orbital dynamics of N finite well-defined bodies under gravitational inter- action. This problem is known as the full gravitational N-body problem obtained after elimi- nating the assumption of punctual masses in the classical N-body problem. We prove that the Newton-Euler equations of motion for this problem are Hamiltonian. Using the natural symme- tries, translations, and rotations, we reduce by six the number of degrees of freedom. Moreover, we compute the reduced spaces, and we show that the translational-reduced space and the rotational-reduced space are both given as non-canonical Hamiltonian systems. Furthermore, we give a detailed description of the generated Poisson structure at each stage of the reduction process. Our analysis found that the total angular momentum and the orthogonality condi- tions of SO(3) are the Casimir functions. By considering the translational-rotational-reduced equations of motion, we characterize the relative equilibria and also classify them into two main categories; Parallel and Non-Parallel equilibria. Among the parallel equilibria, we and the clas- sical Lagrangean and non-Lagrangean equilibria. For N>2, there is one more new type of equilibria which will be dubbed semi-Lagrangean, the latter being original from this research. keywords: Rigid body, reduction, relative equilibria and roto-orbital dynamics.

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