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# Use of Astrodynamical Coördinates to Study Bounded-Keplerian Motion

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This paper reviewed use of the elliptic-astrodynamical-coördinate mesh to study bounded-keplerian motion*. Starting from 12 degrees-of-freedom, the problem reduces to one-parameter problem, since the keplerian orbits are ellipses (Fig. 1). Expressions for the hamiltonian and the lagrangian were obtained. Kepler's equation was shown to be a particular solution of the equation of motion in this coördinate mesh. This formulation was verified by evaluating known expressions and a few applications were presented.

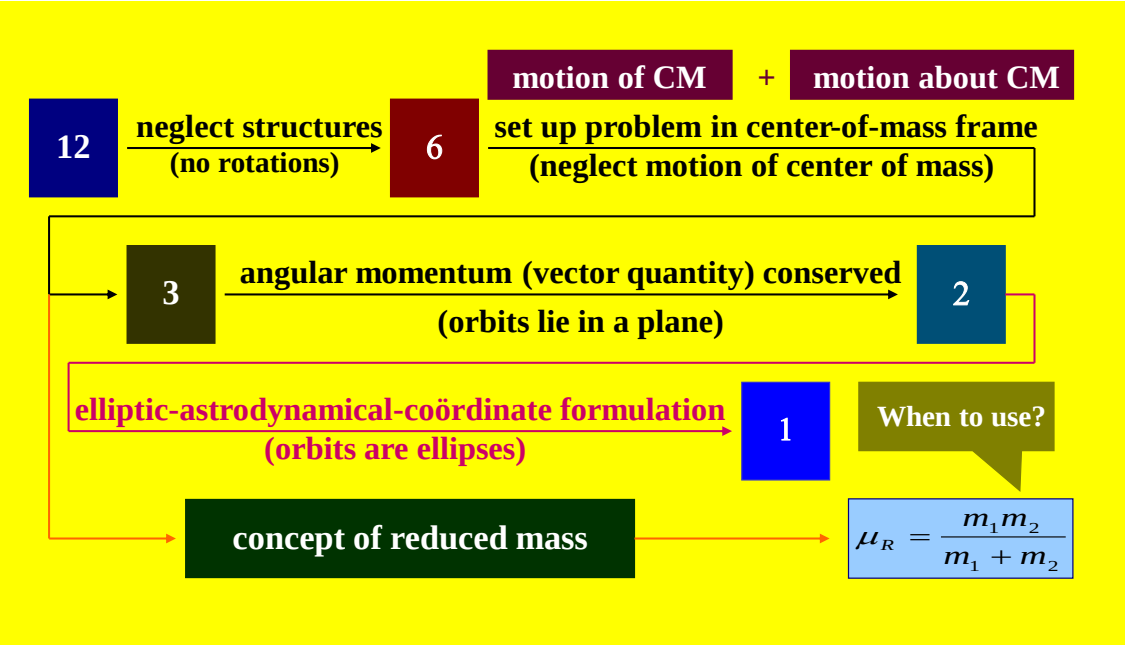


**Fig. 1. Reduction of degrees-of-freedom in two-body problem using the elliptic-astrodynamical-coördinate formulation**

*Keywords*: Center-of-mass frame • Central force • Constants of motion • Kepler's equation • Two-body problem

*Web address of this document*: https://www.ngds-ku.org/Presentations/Astrodynamical.pdf

*Complete formation is available in — Kamal, S. A. (2003). Incompleteness of cross-product steering and a mathematical formulation of extended-cross-product steering. *Proceedings of the Fourth International Bhurban Conference on Applied Sciences and Technologies* (*IBCAST 2002*), *June 10-15, 2002*, Volume 1, Advanced Materials, Computational Fluid Dynamics and Control Engineering, edited by H. R. Hoorani, A. Munir, R. Samar and S. Zahir, National Center for Physics, Islamabad, Pakistan, pp. 167-177, full text:
https://www.ngds-ku.org/Papers/C56.pdf