## Documents

Sharaf, M.A.[a] , Selim, H.H.[b]

**Motion in cylindrical coordinates: Applications to J2 gravity perturbed trajectories of space dynamics**

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[a] Astronomy Department, Faculty of Science, King Abdul Aziz University, Jeddah, Saudi Arabia
[b] Mathematics Department, Faculty of Science, Dammam University, Dammam, Saudi Arabia

**Abstract**
In this paper, a computational algorithm for the initial value problem of J2 gravity perturbed trajectories in cylindrical coordinates will be established. Applications of the algorithm for the problem of the final state prediction are illustrated by numerical examples of eight test orbits of different eccentricities. The numerical results are highly accurate and efficient in predicting J2 final state for gravity perturbed trajectories which is of great importance for scientific researches. Moreover, an additional efficiency of the algorithm is that one can reach the accuracy of one cm using at most 70% of the number of steps that used for obtaining the reference final state solution. By this reduction, the step size becomes larger, hence minimizing the computational errors.

**Author Keywords**
Dynamical astronomy; Initial value problems; Orbit determination

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