

# Hamiltonian Stability Analysis and Chaos: Hamiltonian Theory for Nonlinear Attitude Dynamics of Spacecraft Coupled with Sloshing Liquid in Fuel Container

Salman Ahmad



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In this book, Hamiltonian dynamics is used to control the fuel slosh inside the spacecraft tank. Casimir functions are used for proposed models. Conditions for the stability and instability of moving mass are derived using Lyapunov theory. Equivalent mechanical models of simple pendulum and spring mass for sloshing are used for the stability analysis. Simulation work is presented to strengthen the derived results and to distribute the stable and unstable regions graphically. Nonlinear behavior is discussed by using bifurcation diagram and time history maps. Moreover, influence of boundaries on sloshing is also being discussed. A brief introduction to the partial slip boundaries is explained by using a model with slip length parameter. Simulation results are presented to show the impact of such boundaries on steady fluid flow height.

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