Brouwer Award Plenary Lecture

Wednesday, August 12, 4:00-6:00 PM EDT

“Two Problems: Rotation and Translation”

Professor Robert Melton

Abstract

Two missions serve nicely as examples of the analytical and practical challenges in the dynamics and control of spaceflight. The first part of this lecture addresses time-optimal satellite reorientation, with the Neil Gehrels Swift Observatory mission as the motivating case. Practical issues impose constraints here that also prove to be analytically interesting. A discussion of the general problem comprises examples of various models and solution methods such as pseudospectral and heuristic solution methods and an inverse-dynamics formulation. Onboard implementation of a minimum-time controller appears realistic in the near future.

The proposed LISA mission provides the motivating case in the second part, which examines the matter of relative motion between satellites. This problem has a rich history, with applications ranging from docking maneuvers to distributed sensors. Analytical models, including concise geometric treatments, time-explicit dynamic formulations, and hybrid representations, primarily focus on elliptical orbits; however, hyperbolic cases can also be accommodated.

Biography

Robert Melton is Professor of Aerospace Engineering at The Pennsylvania State University. His research interests include astrodynamics, trajectory optimization and attitude dynamics and control. He is a Fellow of AAS, an Associate Fellow of AIAA, and a Corresponding Member of the International Academy of Astronautics. He has served as Vice President-Technical and Vice President-Publications of AAS, and is a past chair of the Space Flight Mechanics Committee.