ASEN 6008 Interplanetary Mission Design

Lecture s: Monday 6:00 -

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c. The N-body problem
d. Perturbations
e. Patched conics
f. Reference frames
g. Sphere of Influence
h. Hohmann transfers

II. Lambert's Problem
a. Lambert's general theorem
b. Type I vs Type 2 orbits
c. Discussion of Geometry of Lambert's problem
d. Universal Variables Algorithm
e. Revisit f and g functions
f. TOF equations for elliptical, parabolic, and hyperbolic transfers
g. Multi-Revolution solutions (Type 3, Type 4, etc)
h. Algorithm for multi-rev solutions

III. Ephemeris
a. Meeus Coefficients
b. Discussion of JPL Ephemerides

IV. Pork Chop Plots
a. Construction and Analysis

V. Gravity Assists
a. History
b. Vector Diagrams
c. Leading vs Trailing
d. Geometry
e. Computation of parameters (periapsis radius, turn angles, etc)

VI. B-

i. Deterministic vs Stochastic
g. Examples of optimization algorithms

X. Tisserand Plots
XI. Three Body Problem
a. History
b. Simplified forms (Restricted, Elliptical Restricted, Circular Restricted)
XII. Circular Restricted Three Body Problem
a. Geometry of nondimensional, rotating frame
b. Derivation of Equations of Motion
c. Transformation from synodic to inertial frame
d. Libration Points
XIII. State Transition Matrix
a. Motivation
b. Derivation for CRTBP
XIV. Libration Point Orbits
a. History in Mission Design
b. Types of orbits (Halo, Lissajous, etc)
c. Construction of LPOs using Single Shooting Algorithm
d. Stability
XV. Invariant Manifolds
a. Definition
b. Stable/Unstable Eigenvalues and vectors
c. Computing Invariant Manifolds (general discussion)
d. Applications to Mission design
XVI. Differential Correction

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