Technical Comments

Comment on "Minimum Energy-Loss Guidance for Aeroassisted Orbital Plane Change"

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THE authors of Ref. 1 have not discussed three important effects that would change their results considerably. 1) Freeing the boost impulse ΔV_2 from the tangency constraint leads to an optimal out-of-plane thrust angle of $\epsilon_{opt} \approx \arctan(D/L)$, about 23 deg in the example with $L/D = 2.4$, which results in a thrusting plane change during ascent boost of about 15%.[2,3] It reduces fuel required correspondingly. 2) Considering dynamic load limits (accelerations, heat input) will lead to quite different optimal control and state time histories with only minor increases in fuel required.[2-5] 3) Realistic thrust models may lead to singular arcs (for high thrust levels and large plane change angles) or to long burning arcs (for low thrust levels), both of which may have an appreciable effect on the optimal aerodynamic trajectory shaping.[4,5]

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NOTE: Refs. 3 and 4 are available from the Editorial Department, AIAA, 1633 Broadway, New York, NY 10019; price —$8.00 each (hard copy only). **Remittance must accompany order.**

References

[1]Hull, D.G., Giltner, J.M., Speyer, J.L., and Mapar, J., "Minimum Energy-Loss Guidance for Aeroassisted Orbital Plane Change," *Journal of Guidance, Control, and Dynamics,* Vol. 8, July-Aug. 1985, pp. 487-493.

[2]Dickmanns, E.D., *Gesteuerte Drehung von Satellitenbahnen durch Eintauchen in die dichtere Atmosphäre,* Dissertation Rheinisch Westfälische Technische Hochschule, Aachen, FRG, 1969.

[3]Dickmanns, E.D., "Optimal Control for Synergetic Plane Change," *Proceedings of the XXth International Astronautical Congress,* Mar del Plata, Argentina, Oct. 1969, pp. 597-631.

[4]Dickmanns, E.D., "Heating Constrained Synergetic Plane Change with Finite Thrust," *Proceedings of the XXIVth International Astronautical Congress,* Baku, USSR, Oct. 1973.

[5]Dickmanns, E.D., "The Effect of Finite Thrust and Heating Constraints on the Synergetic Plane Change Maneuver for a Space Shuttle Orbiter-Class Vehicles," NASA TN D-7211, 1972.

Book Announcements

RIPLEY, B.D., University of London, ***Spatial Statistics,*** John Wiley and Sons, New York, 1981, 252 pages. $36.50.

Purpose: This text is intended to be a guide to the analysis of spatial data, that is, spatially arranged measurements and spatial patterns. Mathematical prerequisites include matrices, probability, basic topology, and time series analysis.

Contents: Introduction. Basic stochastic processes. Spatial sampling. Smoothing and interpolation. Regional and lattice data. Quadrat counts. Field methods for point patterns. Image analysis and stereology. Bibliography. Indices.

GOPAL, M., Indian Institute of Technology, ***Modern Control System Theory,*** John Wiley and Sons, New York, 1984, 644 pages. $27.95.

Purpose: This book has been developed as a senior- or graduate-level text in modern control theory, including both continuous-time and discrete-time systems. To illustrate the use of the theory, five engineering control problems are analyzed throughout the text.

Contents: Introduction. Linear spaces and linear operators. State variable descriptions. Physical systems and state assignment. Solution of state equations, controllability and observability. Relationship between state variable and input-output descriptions. Stability. Modal control. Optimal control: general mathematical procedures. Optimal feedback control. Stochastic optimal linear estimation and control. Appendices. Index.

HOSTETTER, G.H., University of California at Irvine, **SAVANT, C.J. JR.,** California State University at Long Beach, and **STEFANI, R.T.,** California State University at Long Beach, ***Design of Feedback Control Systems,*** Holt Rinehart and Winston, New York, 1982, 541 pages. $14.95.

Purpose: This book has been developed as a design-oriented text for a first course (junior-senior level) in feedback control systems and for self-study by engineers in industry.

Contents: Introductory concepts. Transfer functions and system response. Characteristic polynomial stability testing. Performance specifications. Root locus analysis and design. Frequency analysis and design. State variable descriptions of continuous-time systems. Digital control. Index.

CLARKE, F.H., University of British Columbia, ***Optimization and Nonsmooth Analysis,*** John Wiley and Sons, New York, 1983, 308 pages. $37.50.

Purpose: The purpose of this book is to present a theory for optimal control problems which do not statisfy the usual, strong smoothness (i.e., differentiability) hypothesis. The theory, however, is still valid for traditional optimal control theory and leads to interesting results in that application.

Contents: Introduction and preview. Generalized gradients. Differential inclusions. The calculus of variations. Optimal control. Mathematical programming. Topics in analysis. Comments. References. Index.