values and eigenvectors between the true GDOP and the approximated GDOP. Table 2 shows the approximation error statistics in a GDOP calculation experiment. These results show that the approximation given in Sec. III seems to be valid. Next, the performance of two satellite selection methods are compared by numerical experiments. A 24-satellite constellation (63-deg orbit inclination, 8 satellites in each orbit) is assumed. Satellite numbers 1–8, 9–16, and 17–24 are in the same orbit planes, respectively. Table 3 shows the satellite selection results by using the proposed methods in Secs. III and IV. The method based on the eigenpolynomial made misselection in several cases. However, the GDOP values in misselection cases are very close to the GDOP of the optimum selection. From these results, the proposed satellite selection methods appear to be effective in the GPS satellite selection problem.

VI. Conclusion

A new geometrical interpretation of the geometric dilution of precision has been proposed, and based on this concept two simple methods of selecting satellites in the global positioning system have been derived which employ the eigenvalue approach and the eigenpolynomial approach. The concept of the geometrical interpretation of the geometric dilution of precision based on the eigenvalue approach seems to be applicable to observation selection in various estimation problems.

Acknowledgment

The author would like to express his sincere thanks to Professor B.D. Tapley of the University of Texas at Austin for his guidance.

References

[1]Fang, B.T., "Geometric Dilution of Precision in Global Positioning System Navigation," *Journal of Guidance and Control,* Vol. 4, Jan.–Feb. 1981, pp 92–94.

[2]Brogan, W.L., "Improvements and Extensions of the Geometric Dilution of Precison Concept for Selecting Navigation Measurements," *Proceedings of IEEE PLANS,* Vol. 80, Dec. 1980, pp 27–32.

[3]Kamat, P.S., "Comment on Geometric Dilution of Precision in Global Positioning System Navigation," *Journal of Guidance and Control,* Vol. 5, May–June 1982, p. 320.

Book Announcements

SZEBEHELY, V., Editor, University of Texas, ***Stability of the Solar System and its Minor Natural and Artificial Bodies,*** D. Reidel, Boston, 1985, 424 pages, $54.00.

Purpose: This bound volume contains the lectures presented at the NATO Advanced Study Institute held in Cortina d'Ampezzo, Italy in August, 1984. The contents listed below represent the major topics discussed at the institute.

Contents: Dynamics of natural and artificial satellites. Theory and application of stability, bifurcation and escape. Resonance and singularities. Hamiltonian mechanics and KAM theory. Chaotic systems and integrability. Geodesic flows, charged particles and extragalactic celestial mechanics.

JUNKINS, J.L., Texas A&M University, and **TURNER, J.D.**, Cambridge Research, ***Optimal Spacecraft Rotational Maneuvers,*** Elsevier, New York, 1986, 516 pages, $109.25.

Purpose: The objective of this text is to provide a unified source of demonstrated methods for computing optimal controls for large-angle nonlinear spacecraft maneuvers.

Contents: Introduction. Geometry and kinematics of rotational motion. Basic principles of dynamics. Rotational dynamics of rigid and multiple rigid body spacecraft. Dynamics of flexible spacecraft. Elements of optimal control theory. Numerical solution of two point boundary value problems. Optimcal maneuvers of rigid spacecraft. Optimal large-angle single-axis maneuvers of flexible spacecraft. Frequency-shaped large-angle maneuvers of flexible spacecraft. Computational methods for closed-loop control problems. Appendices. Index.

BIANCHI, G., and **SCHIEHLEN, W.**, Editors, ***Dynamics of Multibody Systems,*** Springer-Verlag, New York, 1986, 323 pages.

Purpose: This book contains the proceedings of the IUTAM/IFToMM Symposium held at Udine, Italy in September, 1985. The contents presented below are the major topics considered at the symposium.

Contents: Computerized formalisms. Modelling techniques. Solution techniques. Flexible systems. Robotics. Gyrodynamics. Dynamics of machines.

HUGHES, P.C., University of Toronto Institute for Aerospace Studies, ***Spacecraft Attitude Dynamics,*** Wiley, New York, 1986, 564 pages, $47.95.

Purpose: This book has been written with students, practicing aerospace engineers and researchers in mind. Vector dynamics and matrix algebra are the only prerequisites. The book contains 250 figures, 175 problems, and 350 references.

Contents: Introduction. Rotational kinematics. Attitude motion equations. Attitude dynamics of a rigid body. Effect of internal energy dissipation on the directional stability of spinning bodies. Directional stability of multispin vehicles. Effect of internal energy dissipation on the directional stability of gyrostats. Spacecraft torques. Gravitational stabilization. Spin stabilization in orbit. Dual-stabilization in orbit: gyrostats and bias momentum satellites. Appendices. References. Index.