

Malcolm D. Shuster

Topical List of Publications in Astronautics

Attitude Representations

- J-1993h "A Survey of Attitude Representations," Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 41, No. 4, October–December 1993, pp. 439–517.
- J-1993i "The Geometry of the Euler Angles," John L. Junkins and Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 41, No. 4, October–December 1993, pp. 531–543.
- J-2000c "Focal-Plane Representation of Rotations," Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 48, Nos. 2 and 3, April–September 2000, pp. 381–390.
- J-2003d "Generalization of the Euler Angles," Malcolm D. Shuster and F. Landis Markley, *The Journal of the Astronautical Sciences*, Vol. 51, No. 2, April–June 2003, pp. 123–132.
- J-2003i "Uniform Attitude Probability Distributions," Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 51, No. 4, October–December 2003, pp. 451–475.
- J-2004a "Attitude Analysis in Flatland: The Plane Truth," Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 52, Nos. 1 and 2, January–June 2004, pp. 195–209.
- J-2005a "A Simple Derivation of the Gauss-Bonnet Theorem," Ranjan Mukherjee and Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 53, No. 2, April–June 2005, pp. 185–191.
- J-2006a "A General Formula for Extracting the Euler Angles," Malcolm D. Shuster and F. Landis Markley, (Engineering note) *Journal of Guidance, Control and Dynamics*, Vol. 29, No. 1, January–February 2006, pp. 215–217.
- Pubp-018 "A Tutorial on Vectors and Attitude," Joseph van de Ha and Malcolm D. Shuster, to appear in the *IEEE Control Systems Magazine*, Vol. 28, No. 6, December 2008.
- Pubp-021 "The Nature of the Quaternion," M. D. Shuster, submitted to *The Journal of the Astronautical Sciences*, \approx 16 pp.

This list includes: the author's independent publications and preprints in Astronautics according to topic. Errata and later editions are listed with the original publication. Author lists are as they were in the publication. The presenter of a conference article, if not the first author, is indicated by an asterisk. Items are arranged chronologically within categories. Articles may appear in more than one category.

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Attitude Kinematics

- J-1993c “The Kinematic Equation for the Rotation Vector” (Engineering Note), Malcolm D. Shuster, *IEEE Transactions on Aerospace and Electronic Systems*, Vol. 29, No. 1, January 1993, pp. 263–267.
- Pubp-022 “A Tutorial on Attitude Kinematics,” Malcolm D. Shuster, ≈ 29 pp. (not yet submitted, please cite as “in preparation.”)

General Attitude Estimation

- J-1993b “Coarse Attitude Determination from Earth Albedo Measurements,” H. L. Fisher, K. L. Musser, and M. D. Shuster, *IEEE Transactions on Aerospace and Electronics Systems*, Vol. 29, No. 1, January 1993, pp. 22–26.
- J-1993d “Attitude Determination in Higher Dimensions” (Engineering Note), Malcolm D. Shuster, *Journal of Guidance, Control and Dynamics*, Vol. 16, No. 2, March–April 1993, pp. 393–395.
- J-1993j “Quaternion Computation from a Geometric Point of View,” Malcolm D. Shuster and Gregory A. Natanson, *The Journal of the Astronautical Sciences*, Vol. 41, No. 4, October–December 1993, pp. 545–556.
- B-1994c “Spacecraft Attitude Determination and Control,” Malcolm D. Shuster, Chapter 5 in Vincent L. Pisacane and Robert C. Moore (eds.), *Fundamentals of Space Systems*, Oxford University Press, ISBN 0-19-507497-1, 1994, pp. 245–336; second edition (with Wayne Dellinger): Vincent L. Pisacane (ed.) ISBN 0-19-516205-6, June 2005, pp. 236–325.
- C-2000a “A Suboptimal Algorithm for Attitude Determination from Multiple Star Cameras,” Malcolm D. Shuster, Paper AAS-00-124, *AAS/AIAA Space Flight Mechanics Meeting*, Clearwater, Florida, January 23–26, 2000; Proceedings: *Advances in the Astronautical Sciences*, Vol. 105, 2000, pp. 383–394.
- J-2003a “Constraint in Attitude Estimation Part I: Constrained Estimation,” Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 51, No. 1, January–March 2003, pp. 51–74.
- J-2003b “Constraint in Attitude Estimation Part II: Unconstrained Estimation,” Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 51, No. 1, January–March 2003, pp. 75–101.
- J-2003f “Parameter Interference in Distortion and Alignment Calibration,” Roberto V. F. Lopes and Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 51, No. 3, July–September 2003, pp. 261–277.
- J-2003j “Stellar Aberration and Parallax: A Tutorial,” Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 51, No. 4, October–December 2003, pp. 477–494.
- J-2004a “Attitude Analysis in Flatland: The Plane Truth,” Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 52, Nos. 1 and 2, January–June 2004, pp. 195–209.
- J-2004b “SCAD—A Fast Algorithm for Star Camera Attitude Determination,” Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 52, No. 3, July–September 2004, pp. 391–404.
- J-2004c “Deterministic Three-Axis Attitude Determination,” Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 52, No. 3, July–September 2004, pp. 405–419.

- J-2007g “The Maximum-Error Test,” Douglas C. Freesland, Yang Cheng and Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 55, No. 2, April–June 2007, pp. 259–270.
- J-2007h “Effective Direction Measurements for Spacecraft Attitude: I. Equivalent Directions,” Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 55, No. 4, October–December 2007, pp. 463–478.
- J-2007i “Effective Direction Measurements for Spacecraft Attitude: II. Predicted Directions,” Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 55, No. 4, October–December 2007, pp. 479–492.
- J-2007j “Effective Direction Measurements for Spacecraft Attitude: III. Defective Directions and Data Fusion,” Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 55, No. 4, October–December 2007, pp. 493–510.

QUEST

- J-1981a “Three-Axis Attitude Determination from Vector Observations,” M. D. Shuster and S. D. Oh, *Journal of Guidance and Control*, Vol. 4, No. 1, January–February 1981, pp. 70–77.
- J-1983d “A Comment on Fast Three-Axis Attitude Determination Using Vector Observations and Inverse Iteration” (Technical Note), Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 31, No. 4, October–December 1983, pp. 579–584.
- J-1989b “Maximum Likelihood Estimation of Spacecraft Attitude,” Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 37, No. 1, January–March, 1989, pp. 79–88.
- J-1989c “A Simple Kalman Filter and Smoother for Spacecraft Attitude,” Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 37, No. 1, January–March, 1989, pp. 89–106.
- J-1990d “Kalman Filtering of Spacecraft Attitude and the QUEST Model,” Malcolm D. Shuster, *The Journal of the Astronautical Sciences* Vol. 38, No. 3, July–September, 1990, pp. 377–393; Erratum: Vol. 51, No. 3, July–September 2003, p. 359.
- J-2005e “QUEST and the Anti-QUEST: Good and Evil Attitude Estimation,” Yang Cheng and Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 53, No. 3, July–September, 2005, pp. 337–351.
- J-2006c “The Generalized Wahba Problem,” Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 54, No. 2, April–June 2006, pp. 245–259.
- J-2006f “The Quest for Better Attitudes,” Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 54, Nos. 3–4, July–December 2006, pp. 657–683.
- C-2007a “Robustness and Accuracy of the QUEST Algorithm,” Yang Cheng and Malcolm D. Shuster, Paper AAS-07-102, *AAS/AIAA 17th Space Flight Mechanics Meeting*, Sedona, Arizona, January 28–February 2, 2007, 21 pp.; Proceedings: *Advances in the Astronautical Sciences*, Vol. 127, 2007, pp. 41–61.
- C-2007d “The Speed of Attitude Estimation,” Yang Cheng and Malcolm D. Shuster, Paper AAS-07-105, *AAS/AIAA 17th Space Flight Mechanics Meeting*, Sedona, Arizona, January 28–February 2, 2007, 16 pp.; Proceedings: *Advances in the Astronautical Sciences*, Vol. 127, 2007, pp. 101–116.

- Pubp-019 “Filter QUEST or REQUEST,” M. D. Shuster, to appear in the *Journal of Guidance, Control and Dynamics*.
- J-2007h “Effective Direction Measurements for Spacecraft Attitude: I. Equivalent Directions,” Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 55, No. 4, October–December 2007, pp. 463–478.
- J-2007i “Effective Direction Measurements for Spacecraft Attitude: II. Predicted Directions,” Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 55, No. 4, October–December 2007, pp. 479–492.
- J-2007j “Effective Direction Measurements for Spacecraft Attitude: III. Defective Directions and Data Fusion,” Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 55, No. 4, October–December 2007, pp. 493–510.
- C-2008a “The TASTE Test,” Malcolm D. Shuster, *The F. Landis Markley Astronautics Symposium*, Cambridge, Maryland, June 29–July 2, 2008, 8 pp.; Proceedings: *Advances in the Astronautical Sciences*, Vol. 132, 2008, pp. 71–81.
- Pubp-006 “Direction Averaging and Suboptimal Three-Axis Attitude Determination,” Malcolm D. Shuster, submitted to the *IEEE-Transactions on Aerospace and Electronic Systems*, ≈ 7 pp.
- Pubp-008 “Speed Testing of Attitude Estimation Algorithms,” Yang Cheng and Malcolm D. Shuster, submitted to *The Journal of the Astronautical Sciences*, ≈ 15 pp.
- Pubp-010 “An Improvement to the QUEST Algorithm,” Yang Cheng and Malcolm D. Shuster, submitted to *The Journal of the Astronautical Sciences*. ≈ 10 pp.
- Pubp-016 “A Comment on ‘A New Method to Introduce *A Priori* Information in QUEST,’” M. D. Shuster, submitted to *The Journal of the Astronautical Sciences*, ≈ 12 pp.
- Pubp-020 “The TASTE Test,” to appear in *The Journal of the Astronautical Sciences*, ≈ 13 pp.

TRIAD

- J-1993b “Coarse Attitude Determination from Earth Albedo Measurements,” H. L. Fisher, K. L. Musser, and M. D. Shuster, *IEEE Transactions on Aerospace and Electronics Systems*, Vol. 29, No. 1, January 1993, pp. 22–26.
- J-1981a “Three-Axis Attitude Determination from Vector Observations,” M. D. Shuster and S. D. Oh, *Journal of Guidance and Control*, Vol. 4, No. 1, January–February 1981, pp. 70–77.
- J-2006b “The TRIAD Algorithm as Maximum Likelihood Estimation,” Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 54, No. 1, January–March 2006, pp. 113–123.
- C-2007c “The Many TRIAD Algorithms,” Sergei Tanygin and Malcolm D. Shuster, Paper AAS-07-104, *AAS/AIAA 17th Space Flight Mechanics Meeting*, Sedona, Arizona, January 28–February 2, 2007, 19 pp.; Proceedings: *Advances in the Astronautical Sciences*, Vol. 127, 2007, pp. 81–99.
- J-2007f “The Optimization of TRIAD,” Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 55, No. 2, April–June 2007, pp. 245–257.

Spin-Axis Attitude Estimation

- J-1983a “Efficient Algorithms for Spin-Axis Attitude Estimation,” Malcolm D. Shuster. *The Journal of the Astronautical Sciences*, Vol. 31, No. 2, April–June 1983, pp. 237–249; Errata: Vol. 51, No. 1, January–March 2003, p. 121.
- J-1984a “Magnetometer Bias Determination and Spin-Axis Attitude Estimation for the AMPTE Mission” (Engineering Note), R. A. Thompson, G. F. Neal, and M. D. Shuster, *Journal of Guidance, Control and Dynamics*, Vol. 7, No. 4, July–August 1984, pp. 505–507.
- J-2007e “Spin-Axis Attitude Estimation,” Sergei Tanygin and Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 55, No. 1, January–March 2007, pp. 107–139.

Kalman Filter

- J-1982c “Kalman Filtering for Spacecraft Attitude Estimation” (survey paper), E. J. Lefferts, F. L. Markley, and M. D. Shuster, *Journal of Guidance, Control and Dynamics*, Vol. 5, No. 5, September–October 1982, pp. 417–429.
- J-1989c “A Simple Kalman Filter and Smoother for Spacecraft Attitude,” Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 37, No. 1, January–March, 1989, pp. 89–106.
- J-1990d “Kalman Filtering of Spacecraft Attitude and the QUEST Model,” Malcolm D. Shuster, *The Journal of the Astronautical Sciences* Vol. 38, No. 3, July–September, 1990, pp. 377–393; Erratum: Vol. 51, No. 3, July–September 2003, p. 359.
- J-2003g “Batch, Sequential and Hybrid Approaches to Spacecraft Sensor Alignment Estimation,” Maria Cecília Zanardi and Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 51, No. 3, July–September 2003, pp. 279–290.

Alignment Estimation

- J-1991c “Batch Estimation of Spacecraft Sensor Alignments, I. Relative Alignment Estimation,” Malcolm D. Shuster, Daniel S. Pitone, and Gerald J. Bierman *The Journal of the Astronautical Sciences*, Vol. 39, No. 4, October–December, 1991, pp. 519–546.
- J-1991d “Batch Estimation of Spacecraft Sensor Alignments, II. Absolute Alignment Estimation,” Malcolm D. Shuster and Daniel S. Pitone, *The Journal of the Astronautical Sciences*, Vol. 39, No. 4, October–December, 1991, pp. 547–571.
- J-1982b “Inflight Estimation of Spacecraft Attitude-Sensor Accuracy and Alignments,” M. D. Shuster, D. M. Chitre, and D. P. Niebur, *Journal of Guidance, Control and Dynamics*, Vol. 5, No. 4, July–August 1982, pp. 339–343.
- C-1994e “Efficient Estimation of Attitude Sensor Coalignment,” Malcolm D. Shuster, Paper AIAA-1994-3712, *Proceedings, AIAA/AAS Astrodynamics Specialists Conference*, Scottsdale, Arizona, August 1–3, 1994, pp. 45–53.
- J-2003f “Parameter Interference in Distortion and Alignment Calibration,” Roberto V. F. Lopes and Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 51, No. 3, July–September 2003, pp. 261–277.
- J-2003g “Batch, Sequential and Hybrid Approaches to Spacecraft Sensor Alignment Estimation,” Maria Cecília Zanardi and Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 51, No. 3, July–September 2003, pp. 279–290.

Sensor Accuracy Estimation

- J-1982b “Inflight Estimation of Spacecraft Attitude-Sensor Accuracy and Alignments,” M. D. Shuster, D. M. Chitre, and D. P. Niebur, *Journal of Guidance, Control and Dynamics*, Vol. 5, No. 4, July–August 1982, pp. 339–343.

Magnetometer Calibration

- J-1981d “Inflight Magnetometer Calibration and Attitude Determination for Near-Earth Spacecraft,” G. M. Lerner and M. D. Shuster, *Journal of Guidance and Control*, Vol. 4, No. 5, September–October 1981, pp. 518–522.
- J-1984a “Magnetometer Bias Determination and Spin-Axis Attitude Estimation for the AMPTE Mission” (Engineering Note), R. A. Thompson, G. F. Neal, and M. D. Shuster, *Journal of Guidance, Control and Dynamics*, Vol. 7, No. 4, July–August 1984, pp. 505–507.
- J-2002a “TWOSTEP, a Fast Robust Algorithm for Attitude-Independent Magnetometer Bias Determination,” Roberto Alonso and Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 50, No. 4, October–December 2002, pp. 433–451.
- J-2002b “Attitude-Independent Magnetometer Bias Determination, A Survey,” Roberto Alonso and Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 50, No. 4, October–December 2002, pp. 453–475.
- J-2002c “Complete Linear Attitude-Independent Magnetometer Calibration,” Roberto Alonso and Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 50, No. 4, October–December 2002, pp. 477–490.
- J-2003e “Centering and Observability in Attitude-Independent Magnetometer-Bias Determination,” Roberto Alonso and Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 51, No. 2, April–June 2003, pp. 133–141.

Attitude Dynamics and Control

- C-1977b “Analytic Investigation of the AEM-A/HCMM Attitude Control System Performance,” G. M. Lerner, W. Huang, and M. D. Shuster, Paper AAS-77-116, *AAS/AIAA Astrodynamics Specialists Conference*, Grand Teton National Park, Wyoming, September 7–9, 1977, 24 pp.
- B-1978c “Spin-Plane Magnetic-Coil Maneuvers,” M. Grell and M. D. Shuster, Sec. 19.2 in J. R. Wertz (ed.), *Spacecraft Attitude Determination and Control*, Springer, Berlin and New York, ISBN 978-90-277-1204-2, 1978, pp. 642–649.
- B-1994c “Spacecraft Attitude Determination and Control,” Malcolm D. Shuster, Chapter 5 in Vincent L. Pisacane and Robert C. Moore (eds.), *Fundamentals of Space Systems*, Oxford University Press, ISBN 0-19-507497-1, 1994, pp. 245–336; second edition (with Wayne Dellinger): Vincent L. Pisacane (ed.) ISBN 0-19-516205-6, June 2005, pp. 236–325.

Non-Technical

- J-2006e “In My Estimation,” Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 54, Nos. 3–4, July–December 2006, pp. 273–297.
- J-2006f “The Quest for Better Attitudes,” Malcolm D. Shuster, *The Journal of the Astronautical Sciences*, Vol. 54, Nos. 3–4, July–December 2006, pp. 657–683.

- J-2008b “The Arts and Engineering,” Malcolm D. Shuster, *IEEE Control Systems Magazine*, Vol. 28, No. 4, August 2008, pp. 96–98. (This is a revision of a section of “In My Estimation.)
- J-2008c “Advice to Young Researchers,” M. D. Shuster, *IEEE Control Systems Magazine*, Vol. 28, No. 5, October 2008, pp. 113–117, 148. (This is a revision of a section of “In My Estimation.)