

Andrew J. Sinclair Publications

Journal Articles

1. A.J. Sinclair and N.G. Fitz-Coy, "Comparison of Obstacle Avoidance Strategies for Mars Landers", *Journal of Spacecraft and Rockets*, Vol. 40, No. 3, 2003, pp. 388-395.
2. J.E. Hurtado and A.J. Sinclair, "Hamel coefficients for the rotational motion of an N -dimensional rigid body", *Proceedings of the Royal Society of London Series A*, Vol. 460, No. 2052, 08 December 2004, pp. 3613-3630.
3. A.J. Sinclair and J.E. Hurtado, "Cayley kinematics and the Cayley form of dynamic equations", *Proceedings of the Royal Society of London Series A*, Vol. 461, No. 2055, 08 March 2005, pp. 761-781.
4. A.J. Sinclair and J.E. Hurtado, "Minimum-Parameter Representations of N -Dimensional Principal Rotations", *The Journal of the Astronautical Sciences*, Vol. 53, No. 3, July-September 2005, pp. 317-335.
5. A.J. Sinclair, J.E. Hurtado, and J.L. Junkins, "Application of the Cayley Form to General Spacecraft Motion", *Journal of Guidance, Control, and Dynamics*, Vol. 29, No. 2, March-April 2006, pp. 368-373.
6. A.J. Sinclair, J.E. Hurtado, and J.L. Junkins, "Linear Feedback Control Using Quasi Velocities", *Journal of Guidance, Control, and Dynamics*, Vol. 29, No. 6, November-December 2006, pp. 1309-1314.
7. A.J. Sinclair, J.E. Hurtado, and J.L. Junkins, "Nonlinearity Index of the Cayley Form", *The Journal of the Astronautical Sciences*, Vol. 53, Nos. 3 and 4, July-December 2006, pp. 619-634.
8. L.A. Weitz, J.E. Hurtado, and A.J. Sinclair, "Decentralized Cooperative-Control Design for Multivehicle Formations", *Journal of Guidance, Control, and Dynamics*, Vol. 31, No. 4, July-August 2008, pp. 970-979.
9. A.J. Sinclair, J.E. Hurtado, and J.L. Junkins, "Minimum distance and optimal transformations on $SO(N)$ ", *Nonlinear Dynamics*, Vol. 54, No. 3, November 2008, pp. 181-187.
10. A.J. Sinclair, R.J. Prazenica, and D.E. Jeffcoat, "Optimal and Feedback Path Planning for Cooperative Attack", *Journal of Guidance, Control, and Dynamics*, Vol. 31, No. 6, November-December 2008, pp. 1708-1715.
11. C.J. Roy and A.J. Sinclair, "On the Generation of Exact Solutions for Evaluating Numerical Schemes and Estimating Discretization Error", *Journal of Computational Physics*, Vol. 228, No. 5, March 2009, pp. 1790-1802.
12. J.J. Parish, J.E. Hurtado, and A.J. Sinclair, "Direct Linearization of Continuous and Hybrid

Dynamical Systems”, *Journal of Computational and Nonlinear Dynamics*, Vol. 4, No. 3, July 2009, pp. 031002-1 - 031002-11.

13. A.J. Sinclair and J.E. Hurtado, “The eleventh motion constant of the two-body problem”, *Celestial Mechanics and Dynamical Astronomy*, Vol. 110, No. 3, July 2011, pp. 189-198.

14. J.E. Hurtado and A.J. Sinclair, “Lagrangian Mechanics of Overparameterized Systems”, *Nonlinear Dynamics*, Vol. 66, No. 1-2, October 2011, pp. 201-212.

15. J.N. Martin, A.J. Sinclair, and W.A. Foster, “On the Shock-Response-Spectrum Recursive Algorithm of Kelly and Richman”, *Shock and Vibration*, accepted for publication.

16. A.J. Sinclair and G.T. Flowers, “Coupled Flight-Dynamic and Low-Order Aeroelastic Model for a Slender Launch Vehicle”, *Journal of Vibration and Acoustics*, in review.

17. A.J. Sinclair and J.E. Hurtado, “The Motion Constants of Linear Time-Invariant Dynamic Systems”, *SIAM Review*, in review.

18. R.E. Sherrill, A.J. Sinclair, and T.A. Lovell, “Approximate Methods for Extending the Hill-Clohesy-Wiltshire Equations to Elliptic Orbits”, *Celestial Mechanics and Dynamical Astronomy*, in review.

Conference Papers

1. A.J. Sinclair and N.G. Fitz-Coy, “A ‘Bolt-on’ Obstacle Avoidance Strategy for Mars Landers”, AIAA 2002-4826, AIAA/AAS Astrodynamics Specialist Conference, Monterey, California, 5-8 August 2002.

2. A.J. Sinclair, T.A. Henderson, J.E. Hurtado, and J.L. Junkins, “Development of Spacecraft Orbit Determination and Navigation Using Solar Doppler Shift”, AAS 03-159, AAS/AIAA Space Flight Mechanics Meeting, Ponce, Puerto Rico, 9-13 February 2003, published in *Advances in the Astronautical Sciences*, Vol. 114, Part II, Univelt, pp. 895-912.

3. T.A. Henderson, T.C. Pollock, A.J. Sinclair, J.E. Theisinger, J.E. Hurtado, and J.L. Junkins, “Hardware Development and Measurements of Solar Doppler Shift for Spacecraft Orbit Determination”, AAS 03-613, AAS/AIAA Astrodynamics Specialist Conference, Big Sky, Montana, 3-7 August 2003, published in *Advances in the Astronautical Sciences*, Vol. 116, Part III, Univelt, pp. 1765-1778.

4. A.J. Sinclair and J.E. Hurtado, “Application of the Cayley Form to General Spacecraft Motion”, AAS 04-182, AAS/AIAA Space Flight Mechanics Meeting, Maui, Hawaii, 8-12 February 2004, published in *Advances in the Astronautical Sciences*, Vol. 119, Part II, Univelt, pp. 1277-1296.

5. D.T. Griffith, A.J. Sinclair, J.D. Turner, J.E. Hurtado, and J.L. Junkins, “Automatic

Generation and Integration of Equations of Motion by Operator Over-loading Techniques”, AAS 04-242, AAS/AIAA Space Flight Mechanics Meeting, Maui, Hawaii, 8-12 February 2004, published in *Advances in the Astronautical Sciences*, Vol. 119, Part II, Univelt, pp. 2167-2188.

6. A.J. Sinclair and J.E. Hurtado, “Minimum-Parameter Representations of N -Dimensional Principal Rotations”, 6th International Conference on Dynamics and Control of Systems and Structures in Space 2004, Riomaggiore, Italy, 18-22 July 2004.

7. A.J. Sinclair, J.E. Hurtado, and J.L. Junkins, “Investigations on the Use of the Cayley Form for Feedback Controller Design”, AIAA-2004-4761, AIAA Guidance, Navigation, and Control Conference, Providence, Rhode Island, 16-19 August 2004.

-selected one of ten best papers out of 258.

8. A.J. Sinclair, J.E. Hurtado, and J.L. Junkins, “Kinematics of N -Dimensional Principal Rotations”, AAS 05-133, AAS/AIAA Space Flight Mechanics Meeting, Copper Mountain, Colorado, 23-27 January 2005, published in *Advances in the Astronautical Sciences*, Vol. 120, Part I, Univelt, pp. 505-524.

9. A.J. Sinclair, J.E. Hurtado, and J.L. Junkins, “Nonlinearity Index of the Cayley Form”, AAS 05-481, The Malcolm D. Shuster Astronautics Symposium, Buffalo, New York, 12-15 June 2005, published in *Advances in the Astronautical Sciences*, Vol. 122, Univelt, pp. 545-564.

10. J.L. Junkins, P. Singla, J.E. Hurtado, and A.J. Sinclair, “On Coordinate Choices, Regularization, and Degree of Nonlinearity for Dynamical Systems”, International Conference on Computational & Experimental Engineering and Sciences, Chennai, India, 1-6 December 2005.

11. A.J. Sinclair, J.E. Hurtado, and J.L. Junkins, “A Nonlinearity Measure for Estimation Systems”, AAS 06-135, AAS/AIAA Space Flight Mechanics Meeting, Tampa, Florida, 22-26 January 2006, published in *Advances in the Astronautical Sciences*, Vol. 124, Part I, Univelt, pp. 537-554.

12. J.M. Jones, J.E. Hurtado, and A.J. Sinclair, “Direct Linearization of Continuous Dynamical Systems”, AAS 06-104, AAS/AIAA Space Flight Mechanics Meeting, Tampa, Florida, 22-26 January 2006.

13. A.J. Sinclair, J.E. Hurtado, and J.L. Junkins, “Linear Feedback Control Using Quasi Velocities”, AIAA-2006-6423, AIAA Guidance, Navigation, and Control Conference, Keystone, Colorado, 21-24 August 2006.

14. A.J. Sinclair, R.J. Prazhenica, and D.E. Jeffcoat, “Simultaneous Localization and Planning for Cooperative Air Munitions”, 7th International Conference on Cooperative Control and Optimization, Gainesville, Florida, 31 January - 2 February 2007, published in *Lecture Notes in Control and Information Sciences: Advances in Cooperative Control and Optimization*, Vol. 369, Springer, pp. 81-94.

15. J.N. Martin, A.J. Sinclair, and J.E. Cochran, "Nonlinear Tracking of Natural Mechanical Systems for HWIL Simulations", AIAA-2007-6463, AIAA Modeling and Simulation Technology Conference, Hilton Head, South Carolina, 22-26 August 2007.
16. L.A. Weitz, J.E. Hurtado, and A.J. Sinclair, "Decentralized Cooperative-Control Design for Multi-Vehicle Formations", AIAA-2007-6587, AIAA Guidance, Navigation, and Control Conference, Hilton Head, South Carolina, 22-26 August 2007.
17. C.J. Roy and A.J. Sinclair, "On the Generation of Exact Solutions for Evaluating Numerical Schemes and Estimating Discretization Error", NATO AVT Symposium on Computational Uncertainty in Military Vehicle Design, Athens, Greece, 3-6 December 2007, pp. A64-1 - A64-12.
18. E.A. Doucette, A.J. Sinclair, and D.E. Jeffcoat, "Simultaneous Localization and Planning for Cooperative Air Munitions via Dynamic Programming", 8th International Conference on Cooperative Control and Optimization, Gainesville, Florida, 30 January - 1 February 2008, published in Lecture Notes in Control and Information Sciences: Optimization and Cooperative Control Strategies, Vol. 381, Springer, pp. 69-80.
19. M.P. Vautier and A.J. Sinclair, "Coordinate Switching for Accurate Simulation of Chaotic Trajectories", AAS 08-271, F. Landis Markley Astronautics Symposium, Cambridge, Maryland, 29 June - 2 July 2008, published in Advances in the Astronautical Sciences, Vol. 132, Univelt, pp. 187-194.
20. J.E. Hurtado and A.J. Sinclair, "Overparameterized Systems in Astrodynamics", AAS 08-299, F. Landis Markley Astronautics Symposium, Cambridge, Maryland, 29 June - 2 July 2008, published in Advances in the Astronautical Sciences, Vol. 132, Univelt, pp. 691-698.
21. R.E. Sherrill, A.J. Sinclair, and J.E. Cochran, "Scene Generation and Target Detection Development for HWIL Simulation", AIAA 2008-6367, AIAA Modeling and Simulation Technologies Conference, Honolulu, Hawaii, 18-21 August 2008.
22. J.N. Martin, A.J. Sinclair, and J.E. Cochran, "Dynamic-Inversion Control for High-Fidelity HWIL Simulation", AIAA 2008-6525, AIAA Modeling and Simulation Technologies Conference, Honolulu, Hawaii, 18-21 August 2008.
23. M.P. Vautier and A.J. Sinclair, "Effect of Coordinate Switching on Translunar Trajectory Simulation Accuracy", AIAA 2008-7170, AIAA Guidance, Navigation, and Control Conference, Honolulu, Hawaii, 18-21 August 2008.
24. M.J. Kurzen, T.S. Phillips, C.J. Roy, and A.J. Sinclair, "Method of Nearby Problems for Generating Exact Solutions to 1D Unsteady and 2D Steady Problems", AIAA 2009-3652, AIAA Computational Fluid Dynamics Conference, San Antonio, Texas, 22-25 June 2009.
25. A.J. Sinclair and J.E. Hurtado, "The Eleventh Motion Constant of the Two-Body Problem", AAS 10-180, AAS/AIAA Space Flight Mechanics Meeting, San Diego, California, 14-17

February 2010, published in *Advances in the Astronautical Sciences*, Vol. 136, Part II, Univelt, pp. 1221-1228.

26. A.J. Sinclair and G.T. Flowers, “Low-Order Aeroelastic Model of Launch-Vehicle Dynamics”, AIAA 2010-7725, AIAA Guidance, Navigation, and Control Conference, Toronto, Canada, 2-5 August 2010.

27. R.E. Sherrill, A.J. Sinclair, T.A. Lovell, K.W. Johnson, and D.D. Decker, “The Virtual-Chief Method for Modeling Relative Motion of Noncircular Satellites”, AAS 11-214, AAS/AIAA Space Flight Mechanics Meeting, New Orleans, Louisiana, 13-17 February 2011, published in *Advances in the Astronautical Sciences*, Vol. 140, Univelt.

28. R.E. Sherrill, A.J. Sinclair, T.A. Lovell, and R. Linares, “The Virtual-Time Method for Modeling Relative Motion of Noncircular Satellites”, AAS 11-208, AAS/AIAA Space Flight Mechanics Meeting, New Orleans, Louisiana, 13-17 February 2011, published in *Advances in the Astronautical Sciences*, Vol. 140, Univelt.

29. A.A. Jagat and A.J. Sinclair, “Characterization of Numerical Error in the Simulation of Translunar Trajectories Using the Method of Nearby Problems”, AAS 11-281, AAS/AIAA Space Flight Mechanics Meeting, New Orleans, Louisiana, 13-17 February 2011, published in *Advances in the Astronautical Sciences*, Vol. 140, Univelt.

30. A.J. Sinclair and J.E. Hurtado, “Motion Constants of the Hill-Clohessy-Wiltshire Equations”, CEAS EuroGNC Conference, Munich, Germany, 13-15 April 2011.

31. R.E. Sherrill, A.J. Sinclair, and T.A. Lovell, “A Lyapunov-Floquet Generalization of the Hill-Clohessy-Wiltshire Equations”, AAS 12-103, AAS/AIAA Space Flight Mechanics Meeting, Charleston, South Carolina, 29 January - 2 February 2012.

32. A.J. Sinclair, R.E. Sherrill, and T.A. Lovell, “Review of the Solutions to the Tschauner-Hempel Equations for Satellite Relative Motion”, AAS 12-149, AAS/AIAA Space Flight Mechanics Meeting, Charleston, South Carolina, 29 January - 2 February 2012.

33. H. Patel, T.A. Lovell, and A.J. Sinclair, “Relative Orbit Determination for Satellites in Close Proximity Using Angles-Only Observations”, AAS 12-202, AAS/AIAA Space Flight Mechanics Meeting, Charleston, South Carolina, 29 January - 2 February 2012.

34. R.E. Sherrill, A.J. Sinclair, and T.A. Lovell, “Fundamental-Solution Guidance for Satellite Relative Motion in Elliptic Orbits”, IAA Conference on Dynamics and Control of Space Systems, Porto, Portugal, 19-21 March 2012.

Conference Presentations without Papers

1. A.J. Sinclair and J.E. Hurtado, “Review of Geometric Interpretation for Motion Constants of Nonhamiltonian Dynamic Systems”, 44th Annual Technical Meeting of the Society of

Engineering Science, College Station, Texas, 21-24 October 2007.

2. E.A. Doucette, J.W. Curtis, and A.J. Sinclair, “Dynamic Modeling for Particle-Filter Tracking of a Ground Vehicle in an Urban Environment”, INFORMS Annual Meeting, Charlotte, North Carolina, 13-16 November 2011.

Other Publications

1. A.J. Sinclair and J.E. Hurtado, “Motion Constants of the Hill-Clohessy-Wiltshire Equations”, John L. Junkins Festschrift, Ed. T. Alfriend and J.E. Hurtado, ICCES, to appear.

Invited Seminars

1. “Generalization of Rotational Mechanics and Application to Aerospace Systems”, University of Alabama, Aerospace Engineering and Mechanics Department, Tuscaloosa, Alabama, 20 January 2005.

2. “Generalization of Rotational Mechanics and Application to Aerospace Systems”, Auburn University, Aerospace Engineering Department, Auburn, Alabama, 18 February 2005.

3. “Nonlinearity Index of the Cayley Form”, Auburn University, Aerospace Engineering Department, Auburn, Alabama, 16 June 2005.

4. “Generalization of Rotational Mechanics and Application to Aerospace Systems”, Air Force Research Laboratory, Space Vehicles Directorate, Kirtland AFB, New Mexico, 12 July 2005.

5. “The Interface of Dynamics, Control, and Estimation”, University of Florida, Research Engineering and Education Facility, Eglin AFB, Florida, 10 November 2005.

6. “Simultaneous Localization and Planning for Cooperative Air Munitions”, Air Force Research Laboratory, Munitions Directorate, Eglin AFB, Florida, 6 July 2006.

7. “Optimal and Feedback Path Planning for Cooperative Attack”, Air Force Research Laboratory, Munitions Directorate, Eglin AFB, Florida, 26 July 2007.

8. “Directions in Computational Approaches to Orbital Mechanics”, University of Texas, Aerospace Engineering and Engineering Mechanics Department, Austin, Texas, 6 May 2008.

9. “The Role of Motion Constants in Dynamic Systems”, Sandia National Laboratories, Kirtland AFB, New Mexico, 24 June 2010.

10. “Ideas for using HCW equations to describe noncircular-chief relative motion”, Air Force Research Laboratory, Space Vehicles Directorate, Kirtland AFB, New Mexico, 22 July 2010.

11. “The Role of Motion Constants in Dynamic Systems”, Universität Siegen, Institut für Mechanik und Regelungstechnik, Siegen, Germany, 11 April 2011.

12. “Review of the Tschauner-Hempel Equations and Solutions for Satellite Relative Motion”, Air Force Research Laboratory, Space Vehicles Directorate, Kirtland AFB, New Mexico, 27 July 2011.

13. “The Role of Motion Constants in Dynamic Systems”, Virginia Tech, Aerospace and Ocean Engineering Department, Blacksburg, Virginia, 3 October 2011.