

Kyle J. DeMars

Assistant Professor of Aerospace Engineering

Department of Mechanical & Aerospace Engineering
Missouri University of Science and Technology
337 Toomey Hall
400 W. 13th Street
Rolla, MO 65409-0257
573-341-4884 (voice)
573-341-4607 (fax)
demarsk@mst.edu

Research Interests:

Stochastic estimation and control theory; information theory; nonlinear uncertainty prediction and inference; autonomous guidance, navigation, and control of aerospace vehicles; orbit determination, data association, conjunction assessment, and collision avoidance; attitude dynamics, determination, and control; autonomous sensor management; high-fidelity dynamical and observational modeling

Education:

- Ph.D., Aerospace Engineering, The University of Texas at Austin (2010)
- M.S.E., Aerospace Engineering, The University of Texas at Austin (2007)
- B.S.As.E., Aerospace Engineering, The University of Texas at Austin (2004) with High Honors

Academic Positions:

- Assistant Professor of Aerospace Engineering, Missouri S&T, 2013-present

Professional Affiliations:

- American Institute of Aeronautics and Astronautics (AIAA)
- American Astronautical Society (AAS)
- Institute of Electrical and Electronics Engineers (IEEE)

Honors and Awards:

- National Research Council Postdoctoral Research Associateship (2011-2012)
- Texas Space Grant Consortium Fellowship (2010-2011, 2009-2010, 2007-2008)
- John and Mary Wheeler Endowed Graduate Fellowship (2009-2010)
- Jack and Maxine Zarrow Thrust 2000 Fellowship (2005-2008)

Selected Journal Publications:

- Kyle J. DeMars and Moriba K. Jah. A probabilistic approach to initial orbit determination via Gaussian mixture models. *Journal of Guidance, Control, and Dynamics* (submitted).

- Kyle J. DeMars, Robert H. Bishop, and Moriba K. Jah. An entropy-based approach for uncertainty propagation of nonlinear dynamical systems. *Journal of Guidance, Control, and Dynamics* (accepted).
- Renato Zanetti and Kyle J. DeMars. Joseph formulation of unscented and quadrature filters with application to consider states. *Journal of Guidance, Control, and Dynamics* (accepted).
- Thomas Kelecyc, Moriba Jah, and Kyle DeMars. Application of a multiple hypothesis filter to near GEO high area-to-mass ratio space objects state estimation. *Acta Astronautica*, 81:435–444, 2012.
- Kyle J. DeMars, Moriba K. Jah, and Paul W. Schumacher. Initial orbit determination using short-arc angle and angle rate data. *IEEE Transactions on Aerospace and Electronic Systems*, 48(3):2628–2637, July 2012.
- Renato Zanetti, Kyle J. DeMars, and Robert H. Bishop. Underweighting nonlinear measurements. *Journal of Guidance, Control, and Dynamics*, 33(5):1670–1675, September–October 2010.

Conference Papers:

- Yang Cheng, Kyle J. DeMars, Carolin Fröhlich, and Moriba K. Jah. Gaussian mixture PHD filter for space object tracking. Lihue, Hawaii, 2013. 23rd AAS/AIAA Space Flight Mechanics Meeting.
- Kyle J. DeMars and Renato Zanetti. Applications of unscented and quadrature consider filters using a modified Joseph formulation. Lihue, Hawaii, 2013. 23rd AAS/AIAA Space Flight Mechanics Meeting.
- Patrick S. Williams, David B. Spencer, R. Scott Erwin, and Kyle J. DeMars. The effects of uncertainty estimation on dynamic sensor tasking. Minneapolis, Minnesota, 2012. AAS/AIAA Astrodynamics Specialist Conference.
- Islam I. Hussein, Kyle J. DeMars, Carolin Fröhlich, Moriba K. Jah, and R. Scott Erwin. An AEGIS-FISST algorithm for multiple object tracking in space situational awareness. Minneapolis, Minnesota, 2012. AAS/AIAA Astrodynamics Specialist Conference.
- Kyle J. DeMars, Islam I. Hussein, R. Scott Erwin, and Moriba K. Jah. The Cauchy-Schwarz divergence for assessing situational information gain. Singapore, 2012. 15th International Conference on Information Fusion.
- Islam I. Hussein, Kyle J. DeMars, Carolin Fröhlich, R. Scott Erwin, and Moriba K. Jah. An AEGIS-FISST integrated detection and tracking approach to space situational awareness. Singapore, 2012. 15th International Conference on Information Fusion.
- Richard Linares, Moriba K. Jah, and Kyle J. DeMars. Improved methods for tracking and characterizing inactive space objects. Breckenridge, Colorado, February 2012. 35th AAS Guidance and Control Conference.
- Renato Zanetti, Kyle J. DeMars, and Daniele Mortari. Novel multiplicative unscented Kalman filter

for attitude estimation. Charleston, South Carolina, February 2012. 22nd AAS/AIAA Space Flight Mechanics Meeting.

- Matthew R. Turnowicz, Kyle J. DeMars, Bin Jia, Ming Xin, Yang Cheng, and Moriba K. Jah. Quadrature methods for orbit uncertainty propagation under solar radiation pressure. Charleston, South Carolina, February 2012. 22nd AAS/AIAA Space Flight Mechanics Meeting.

- Kyle J. DeMars, Yang Cheng, Robert H. Bishop, and Moriba K. Jah. Methods for splitting Gaussian distributions and applications within the AEGIS filter. Charleston, South Carolina, February 2012. 22nd AAS/AIAA Space Flight Mechanics Meeting.

- Kyle J. DeMars and Moriba K. Jah. Initial orbit determination via Gaussian mixture approximation of the admissible region. Charleston, South Carolina, February 2012. 22nd AAS/AIAA Space Flight Mechanics Meeting.

- Thomas Kelecy, Moriba K. Jah, and Kyle J. DeMars. Application of a multiple hypothesis filter to near GEO high area-to-mass ratio space objects state estimation. Cape Town, South Africa, October 2011. 62nd International Astronautical Congress.

- Kyle J. DeMars and Moriba K. Jah. Evaluation of the information content of observations with application to sensor management for orbit determination. Girdwood, Alaska, July-August 2011. AAS/AIAA Astrodynamics Specialist Conference.

- Kyle J. DeMars, Robert H. Bishop, and Moriba K. Jah. Space object tracking in the presence of attitude-dependent solar radiation pressure effects. Girdwood, Alaska, July-August 2011. AAS/AIAA Astrodynamics Specialist Conference.

- Richard Linares, Kyle J. DeMars, and Moriba K. Jah. Improved methods for tracking and characterizing inactive resident space objects. Okinawa, Japan, June 2011. 28th International Symposium on Space Technology and Science.

- Kyle J. DeMars, Robert H. Bishop, and Moriba K. Jah. A splitting Gaussian mixture method for the propagation of uncertainty in orbital mechanics. New Orleans, Louisiana, February 2011. 21st AAS/AIAA Space Flight Mechanics Meeting.

- Tye Brady, Stephen Paschall, Kyle J. DeMars, Timothy P. Crain, and Robert H. Bishop. GENIE flight test results and system overview. Breckenridge, Colorado, February 2011. 34th AAS Guidance and Control Conference.

- Kyle J. DeMars, Moriba K. Jah, and Paul W. Schumacher. The use of short-arc angle and angle rate data for deep-space initial orbit determination and track association. Madrid, Spain, May 2010. 4th International Conference on Astrodynamics Tools and Techniques.

- Kyle J. DeMars, Moriba K. Jah, and Paul W. Schumacher. The use of short-arc angle and angle rate data for deep-space initial orbit determination and track association. Kihei, Hawaii, 2010. 8th US-Russia Space Surveillance Conference.

- Kyle J. DeMars, Moriba K. Jah, and Paul W. Schumacher. The use of angle and angle rate data for

deep-space orbit determination and track association. San Diego, California, February 2010. 20th AAS/AIAA Space Flight Mechanics Meeting.

- Kyle J. DeMars, Paige S. Felker, and Robert H. Bishop. Reduced complexity gravity modeling for rapid design environments. San Diego, California, February 2010. 20th AAS/AIAA Space Flight Mechanics Meeting.

- Kyle J. DeMars, Moriba K. Jah, Daniel R. Giza, and Thomas M. Kelecy. Orbit determination performance improvements for high area-to-mass ratio space object tracking using an adaptive Gaussian mixtures estimation algorithm. Toulouse, France, September 2009. 21st International Symposium on Space Flight Dynamics.

- Renato Zanetti, Kyle J. DeMars, and Robert H. Bishop. On underweighting LIDAR measurements. Pittsburgh, Pennsylvania, August 2009. AIAA/AAS Astrodynamics Specialist Conference.

- Kyle J. DeMars and Moriba K. Jah. Passive multi-target tracking with application to orbit determination for geosynchronous objects. Savannah, Georgia, February 2009. 19th AAS/AIAA Space Flight Mechanics Meeting.

- Moriba K. Jah, Thomas Kelecy, and Kyle J. DeMars. Orbit determination strategies addressing the search, acquisition, and characterization of geosynchronous space debris objects. Glasgow, Scotland, September-October 2009. 59th International Astronautical Congress.

- Jody L. Davis, Scott A. Striepe, Robert W. Maddock, Glenn D. Hines, Stephen Paschall, Babak E. Cohan, Thomas Fill, Michael C. Johnson, Robert H. Bishop, Kyle J. DeMars, and Ronald R. Sostaric. Advances in POST2 end-to-end descent and landing simulation for the ALHAT project. Honolulu, Hawaii, August 2008. AIAA/AAS Astrodynamics Specialist Conference.

- Kyle J. DeMars, Robert H. Bishop, Timothy P. Crain, and Gerald L. Condon. Engineering analysis of guidance and navigation performance in the uncertain lunar environment to support human exploration. Breckenridge, Colorado, February 2008. 31st AAS Guidance and Control Conference.

- Kyle J. DeMars and Robert H. Bishop. Navigation analysis to facilitate precision descent navigation for landing at the moon. Galveston, Texas, January 2008. 18th AAS/AIAA Space Flight Mechanics Meeting.

- Kyle J. DeMars and Robert H. Bishop. Precision descent navigation for landing at the moon. Mackinac Island, Michigan, August 2007. AIAA/AAS Astrodynamics Specialist Conference.

- Robert H. Bishop and Kyle J. DeMars. Precision entry navigation for lunar landings. Princeton University, Princeton, New Jersey, 2007. New Trends in Astrodynamics and Applications IV.

- Kyle J. DeMars. Numerical solutions to libration points: Designing a generalized system. Fort Worth, Texas, 2004. AIAA Region IV Student Conference.