

AAE FALL COLLOQUIUM SERIES

Correlation of Uncorrelated Tracks Using the Mahalanobis Distance

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Abstract:

A sensor track is the set of observations obtained by a sensor from the passage of a space object through the sensor field of view. Uncorrelated tracks (UCTs) are tracks that do not correlate to any object in the space object catalog. For an object to be catalogued 3-4 tracks sufficiently separated in time must be associated or correlated. Obviously every new object starts out as a UCT. UCT association is one of the major challenges in Space Domain Awareness. With the new Space Fence and DARPA Space Surveillance telescope becoming operational smaller objects are being tracked and the catalog is expected to grow from the current 30,000+ objects to 100,000-150,000 objects. With this significant growth having an automated method for correlating tracks is a necessity. Breakups or collisions in space, such as the Iridium-Cosmos collision in 2007, create thousands of new objects and it can take months to catalog them. This presentation presents new research on UCT association using the Mahalanobis distance with modified equinoctial elements. It will be shown that tracks of low Earth orbit objects separated by weeks can be associated and catalogued. With the return to the moon many new satellites are going to the moon and keeping track of them is another challenge. Some initial results on adapting this approach using the Mahalanobis distance for track association in cislunar space will be presented.

Biography

Dr. Terry Alfriend is currently the Professor and Holder of the Jack E. & Francis Brown Chair II of Aerospace Engineering at Texas A&M University and a University Distinguished Professor. He has over 50 years of diverse experience in the aerospace business that includes research, development and management in the private sector, government, and academia. He is a member of the NAE, an Honorary Fellow of the AAS and AIAA and a member of the International Academy of Astronautics. He has served as an Associate Editor and Editor-in-Chief of both the AAS Journal of the Astronautical Sciences and the AIAA Journal of Guidance, Control and Dynamics. He is also the recipient of the AAS Dirk Brouwer Award, the AIAA Mechanics and Control of Flight Award and the AIAA Guidance, Navigation and Control of Flight Award. His research interests are in space domain awareness, astrodynamics, satellite attitude dynamics and control and spacecraft design.