Evolving Spacecraft Problems in the Realm of Decision, Guidance, Control, & Estimation

ABSTRACT

As the spacecraft domain becomes more congested, contested and competitive, there arise numerous problems which must be addressed. In particular is within the realm of low earth orbit to geostationary orbit, where research opportunities include, but are not limited to, efficient & safe maneuvering, repair/servicing, formation flight, debris removal, etc. This talk will discuss and explore the ever evolving problems which are of interest to the Air Force, focusing on the realm of advanced GN&C and autonomy/decision making.

Specifically, the talk will touch on several current research projects ongoing at AFRL in these interest areas, including: advanced optimal guidance & estimation, autonomous decision making, advanced V&V techniques, and spacecraft formation control. A primary focus will be given to optimization techniques for spacecraft (such as MPC/RG) that not only emphasize efficiency in terms of fuel/computation, but also guarantees of convergence, feasibility, and recursive stability. The talk will also highlight the various test facilities by which algorithms are verified and validated, with an emphasis on future opportunities for collaboration.

The talk will conclude with information on how interested students and faculty can become involved with the research in these areas being conducted at AFRL.

ABOUT THE SPEAKER

Dr. Christopher Petersen is a Research Aerospace Engineer in the Guidance, Navigation, & Control Section within the Space Vehicles Directorate of the U.S. Air Force Research Laboratory located at Kirtland Air Force Base in New Mexico. He received a B.S. from Syracuse University in Aerospace Engineering in 2012, and a M.S. and Ph.D. from University of Michigan in 2016 in Spacecraft Dynamics & Control. He is currently the Guidance & Control lead for the GN&C Program, performing advanced algorithm design and support for AF flight experiments. In addition, he holds an appointment as a Research Professor at University of New Mexico in the Electrical Engineering Department.

His research interests include optimal and predictive GN&C, geometric control & estimation, identifying and exploiting estimation & control interactions, underactuated control, and spacecraft rotational/translation coupling.