DEPARTMENT OF MECHANICAL & AEROSPACE ENGINEERING
WILLIAM MAXWELL REED SEMINAR SERIES

"Fail-Safe Spacecraft Rendezvous."

Avishai Weiss, Ph.D.
Mitsubishi Electric Research Laboratories (MERL)

Abstract:

Spacecraft are expensive to manufacture and launch into space, and are not easily repaired once in orbit. They must therefore be fault-tolerant and capable of robust operation in various conditions, such as thruster failure. Thruster failures are particularly perilous during spacecraft rendezvous as they could lead to collision and catastrophic damage. As rendezvous becomes increasingly commonplace with orbital servicing and scientific missions, and with the projected increased cadence of human crewed and cargo vehicles heading to the ISS, Moon, and beyond, there is a need to develop flexible, autonomous, and – importantly – safe rendezvous technology.

In this talk, I will describe some recent developments on fail-safe spacecraft rendezvous, which guarantee safety after a thruster anomaly, such that the approaching spacecraft steers clear of and avoids colliding with the target. I will discuss our approach that leverages reachable sets to characterize the unsafe regions of space around a target in which passive or active aborts are infeasible, and how we can use reachable sets to further improve our solution's fuel efficiency. We will take a look at simulation results in Earth orbit and on a near-rectilinear halo orbit in the Earth-Moon 3-body system.

Speaker Bio:

Avishai Weiss received a B.S. in electrical engineering and an M.S. in aeronautics and astronautics from Stanford University in 2008 and 2009, respectively, and a Ph.D. in aerospace engineering from the University of Michigan, Ann Arbor in 2013. He is currently a Principal Research Scientist at Mitsubishi Electric Research Laboratories (MERL) in Cambridge, MA. His main research interests and contributions are in the areas of spacecraft orbital and attitude control, model predictive control, safe motion planning, and time-varying systems, in which he has authored and co-authored more than 75 peer-reviewed papers and patents.

Date: Friday, November 11, 2022
Time: 3:00 PM EST
Place: Whitehall Classroom Building 110
Contact: Dr. Jesse Hoagg

Attendance open to all interested persons

College of Engineering

DEPARTMENT OF MECHANICAL & AEROSPACE ENGINEERING
UNIVERSITY OF KENTUCKY
LEXINGTON, KENTUCKY