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AR&C Review Presentation Abstract
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Control of a Varying Thrust Spacecraft for Autonomous Space Rendezvous

Before the use of autonomous rendezvous will be allowed as a substitute for man-in-the-loop control, adequate safety and mission performance will have to be guaranteed. Most autopilots for autonomous rendezvous of spacecraft assume constant thrust reaction control system (RCS) thrusters. This assumption implies either true constant thrust RCS thrusters or thrusters whose thrust levels vary very slowly. The ongoing work described in this presentation examines the autonomous rendezvous problem when varying thrust RCS thrusters are inherent in the system equations of motion. We begin with the linearized planar relative motion equations

$$\ddot{X} = 2\omega\dot{Y} + \frac{u_x(t)}{m}$$

$$\ddot{Y} = 3\omega^2 Y - 2\omega\dot{X} + \frac{u_y(t)}{m}$$

where

m = mass of body in relative motion, and
ω = the orbital angualr rate.

We then assign state variables and derive a matric equation of motion of the form

$$\dot{x} = Ax + bu$$

where

x is the state variable vector,
A, b are the plant definition matrices, and
u is the set of control inputs.

Using this basic matric equation, a control theory is applied which incorporates the variable nature of the RCS thrusters and developes a control law that insures global stability and optimal performance.