

Attitude Control Module

The Attitude Control Module for use with the Spacecraft Control Toolbox, provides the user with complete attitude control systems based on Spacecraft Control Toolbox functions.

Features

- Sun nadir pointing spacecraft using reaction wheels for pointing control and magnetic torquers for momentum control
- Momentum bias geosynchronous spacecraft control system including both mission and transfer orbit
- Spinning spacecraft with reaction wheel control
- Reaction wheel control with any number of wheels
- Double pivoted momentum wheel roll/yaw control
- Attitude maneuvering algorithms
- Magnetic control algorithms for instantaneous two axis and average three axis control.
- Momentum unloading
- Spinning transfer orbit control
- Thruster control
- Stationkeeping attitude control

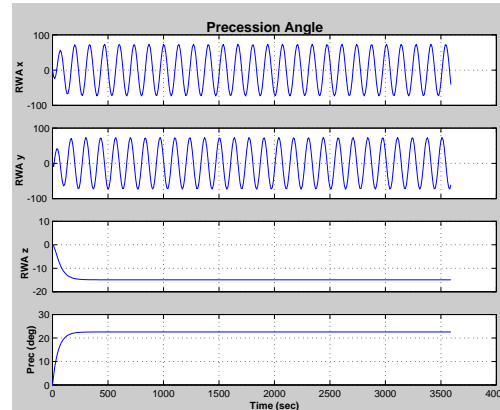
Sun Nadir Pointing Control

Sun nadir pointing control is used on numerous spacecraft, such as GPS IIR and Topex. In a sun nadir design the spacecraft is steered around yaw and the solar arrays steered about pitch so that the arrays are always normal to the sun. This maximizes the power output from the solar arrays and eliminates the need for an additional hinge. When the sun angle is low with respect to the orbit plane, the spacecraft flips 180 deg at noon and midnight.

Spinning Spacecraft with Reaction Wheel Control

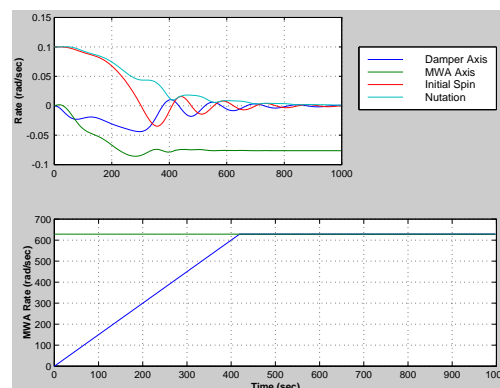
This approach was used on the Microwave Anisotropy Probe. A spacecraft needs to rotate such that one of its axes is offset from a fixed inertial direction. This can be done with reaction wheels. The following plot shows the reaction wheel and pre-

cession angle history.



Geosynchronous Spacecraft Control

A low-cost approach to geosynchronous spacecraft control system design is to use a fixed momentum wheel for pitch control, magnetic torquers for roll yaw control, and monopropellant thrusters for 3-axis control during stationkeeping. The spacecraft is spin stabilized during transfer orbit and orbit insertion is done using a solid rocket. The spacecraft transitions from spinning to momentum bias using the dual-spin turn shown below.



Compatibility

The toolbox is compatible with MATLAB v5.2 through 7, Windows XP/NT/2000, UNIX, and MacOS. It requires the Spacecraft Control Toolbox Core module.