

Linear Dynamic Modelling of Spacecraft with Open-Chain Assembly of Flexible Bodies for AOCS/Structure Co-Design

This work presents a method to build a linear dynamic model of open-chain assembly of spacecraft flexible appendages for future Attitude Control System (ACS)/Structure co-design. This kind of modeling takes into account the flexible interactions between all the spacecraft substructures, called bodies or appendages, to finally provide the loads (forces and torques) induced to the main body. More generally, this method can be applied to any open mechanical chain, such as segments of robotic arms, segments of antenna mast or masts linking solar panels to the main hub. Therefore, the dynamics model of the entire spacecraft can be derived easily in order to design the spacecraft ACS. The method is based on the Craig-Bampton modal synthesis, from which a state-space representation is obtained.