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Coupled Spacecraft Orbital and Attitude Modeling and Simulation in Multi-Complex Modes

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Abstract : This paper presents verification of a modeling and simulation for a Spacecraft (SC) attitude and orbit control system. Detailed formulation of coupled SC orbital and attitude equations of motion is performed in order to achieve accepted accuracy to meet the requirements of multitargets tracking and orbit correction complex modes. Correction of the target parameter based on the estimated state vector during shooting time to enhance pointing accuracy is considered. Time-optimal nonlinear feedback control technique was used in order to take full advantage of the maximum torques that the controller can deliver. This simulation provides options for visualizing SC trajectory and attitude in a 3D environment by including an interface with V-Realm Builder and VR Sink in Simulink/MATLAB. Verification data confirms the simulation results, ensuring that the model and the proposed control law can be used successfully for large and fast tracking and is robust enough to keep the pointing accuracy within the desired limits with considerable uncertainty in inertia and control torque.

Keywords : attitude and orbit control, time-optimal nonlinear feedback control, modeling and simulation, pointing accuracy, maximum torques
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