

Motion Planning and Control of a Space Robot to Capture a Tumbling Debris

Space robotics has emerged as one of the key technology for on-orbit servicing or debris removal issues. In the latter, the target is a specific point of a tumbling debris, that the «chaser» satellite must accurately track to ensure a smooth capture by its robotic arm. Based on recent works by Aghili, an optimal capture trajectory is presented to match position and speed, but also acceleration of the target. Two controllers are simultaneously synthesized for the satellite and the arm, using the fixed-structure H-infinity synthesis. Their tracking performance is validated for the tumbling target capture scenario. The main goal is to efficiently track the optimal trajectory while using simple PD-like controllers to reduce computational burden. The fixed-structure H-infinity framework proves to be a suitable tool to design a reduced-order robust controller compatible with current space processors capabilities.