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AUTONOMOUS ANTENNA POINTING UNDER THE IMPACT OF UNPREDICTABLE PLATFORM MOVEMENT

Abstract

To meet the high requirements of future missions like on-orbit servicing and interactive earth observation, technologies for real-time communication between low earth orbit spacecrafts and geostationary data relay satellites are being developed at the institute of Astronautics. One of these technologies is a compact Ka-Band intersatellite antenna system with high precision, two axis pointing mechanism enabling long access periods via Geostationary Data Relay Satellite (DRS). Due to the interactive manner of real-time teleoperation, autonomic pointing becomes a challenging issue as the rapidly changing platform motion is not predictable for the whole operation period. Hence antenna trajectories cannot be calculated beforehand.

A detailed dynamic simulation of the coupled dynamics between platform and antenna system was used to analyze and optimize control methods. In order to test and demonstrate pointing performance, a verification platform for static and dynamic accuracy measurements was set up. This platform encloses a high precision inertial navigation system (INS) based on a GPS system and a tactical grade inertial measurement unit (IMU). Azimuth and elevation set points for the pointing control are calculated at high frequency based on INS data.

This paper discusses control methods and simulation results for highly autonomous antenna pointing and presents performance measurements.